CLINICAL GYNÆCOLOGY

MEDICAL & SURGICAL

BY

AMERICAN TEACHERS.

EDITED BY

JOHN M. KEATING, M.D., LL.D.,

AND

HENRY C. COE, M.D., M.R.C.S.,

PROFESSOR OF GYNÆCOLOGY, NEW YORK POLYCLINIC.

VOLUME SECOND.

ILLUSTRATED WITH FULL-PAGE PLATES & ENGRAVINGS IN THE TEXT

EDINBURGH & LONDON:

YOUNG J. PENTLAND.

1895.

CHAPTER X.

NEOPLASMS OF THE VULVA AND VAGINA.

BY HERMANN J. BOLDT, M.D.

CONDYLOMATA.

THE most frequent new growths on the vulva are the condylomata, often called papillomata. They may be divided into two varieties: 1. Simple papillomata, or ordinary warts, which are non specific, and cause no annoyance, except, very rarely, by their size. No particular cause is known for their occurrence. Their usual site is on the labia majora and the mons veneris. 2. Pointed condylomata, or condylomata acuminata.

FIG. 1.
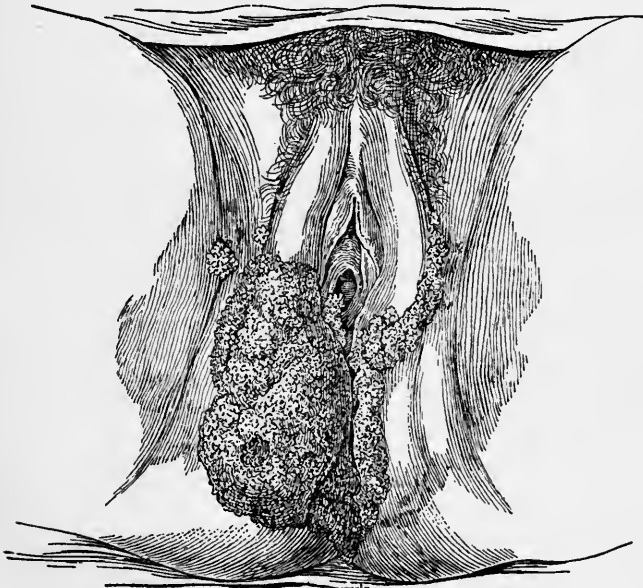
Condyloma of vulva. (Tarnier.)

In structure the simple papillomata resemble ordinary warts; they vary in size from that of a pin-head to that of a fœtal head, and when isolated they project so prominently that the name "cock's comb" has been applied to them. When a number of condylomata coalesce, they resemble in shape a head of cauliflower.

They are most frequently situated upon the vulva and around the anus, but they also occur on the perineum, and occasionally in the vagina. Fowlerton reports a case in which the papillomata blocked up the vagina, causing obstruction to coitus. Their color is usually a very pale pink, but the vegetations may assume a dark and occasionally a turgid hue.

The flat condylomata (*plaques muqueuses*), which are not tumors in the proper sense of the word, are invariably caused by syphilis; and in women they not infrequently represent the primary form of the disease.

The condylomata acuminata, or pointed condylomata, it is taught, may occur independently of gonorrhœal infection. The correctness of this teaching is doubtful: I have never seen a case in which a specific source could not be traced with reasonable certainty. The argument brought forward as conclusive evidence that these growths do occur without venereal infection is, that they occur occasionally in chaste women during pregnancy, usually disappearing spontaneously after labor. Though the woman be chaste, that does not make the husband so. Observation has shown their occurrence even in children, although bacteriologists have not yet succeeded in proving the presence of gonococci in pointed condylomata. The case reported by Marshall as papilloma in a child two years old admits of some doubt as to the exact nature of the neoplasm.

Their spontaneous disappearance after parturition is accounted for by the changes which take place in the circulation of the parts, but such disappearance is not the rule, neither is it advisable to wait for it, on account of the danger of ophthalmia in the new-born infant, resulting from infection. The prognosis is favorable.

In the treatment of these condylomata cleanliness must be observed. Locally, pure tannic acid is one of the best astringents. Any astringent, however, will act beneficially. The preferable treatment is surgical. It is best to cut them off with scissors and to touch the base of the wound with nitrate of silver, perchloride of iron, or the actual cautery, to control the usually rather profuse hemorrhage.

We must also employ other local treatment to allay the vaginal discharge. I prefer for this purpose a solution of nitrate of silver 1 : 20 to 1 : 30, used locally with an absorbent cotton swab over the vaginal mucosa, or to fill the vagina with subnitrate of bismuth every second day, using a douche of 1 : 2000 hot sublimate solution prior to the insufflation.
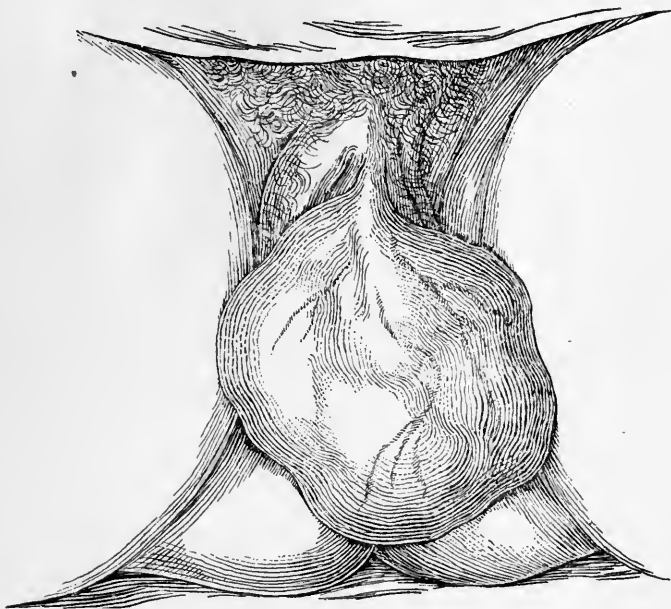
LIPOMA.

Fatty tumors have their origin either in the labium majus or in the mons veneris; they sometimes attain large dimensions, causing inconvenience to the patient. Thus, Strigele removed one weighing ten pounds; Deekens reports a lipoma the size of a lemon which underwent an ulcerative process and caused dangerous hemorrhage. I have removed one weighing ten ounces, which was attached to the left labium majus by a pedicle two inches long. (See Fig. 2.) In this case the tumor was not altogether of

fat tissue, the lobules of the latter being enveloped with a fibrous connective tissue : hence the designation fibro-lipoma.

These tumors may be mistaken for fibromata and elephantiasis.   From the former they are distinguished by their elasticity, which is quite characteristic on palpation ; from the latter, by being circumscribed and usually pedunculated, which is rare in elephantiasis.   The derma at the base of the tumor is changed in elephantiasis and is normal in lipoma.

FIG. 2.

Lipoma of vulva.

The treatment is surgical ; they are readily removed.   If attached by a thin pedicle, as in my case, a ligature is placed around this and the tumor is snipped off.   If there is a broad base, the growth must be excised and its bed stitched, preferably with a continuous catgut suture.

MYOMA, FIBROMA, MYO-FIBROMA, MYXOMA, AND MIXED GROWTHS.

These tumors have their origin ordinarily in the labium majus, although they are not limited to this part, being sometimes situated on the nymphæ.   They are composed mainly of fibrous connective tissue, with some muscular structure ; the latter is presumably derived from fibres of the round ligament or the numerous muscle-bundles of the derma.   In appearance they do not differ from the lipomata previously described.

Myxomata occur occasionally in the same locality, and are so designated on account of the preponderance of myxomatous tissue.

Mixed varieties occur, as myxo-lipoma and myo-fibroma.

These tumors have a tendency to increase slightly in size during preg-

34

nancy and menstruation, but usually diminish to their former volume after the subsidence of these processes, unless, as occasionally happens, a hemorrhage takes place into their interior, when the increase in size is sudden and permanent; otherwise their growth is slow.

FIG. 3.

Fibroid polypus of vulva.

Inasmuch as their tendency is to grow in the direction of least resistance, it is not unusual for them to become pedunculated; they sometimes reach as low as the knees: under such circumstances it is not uncommon for inflammation and ulceration of the surfaces to occur, as the result of friction. They are benign, and their treatment is surgical, being the same as for lipoma. The removal of the growths, if done with ordinary care, is devoid of danger.
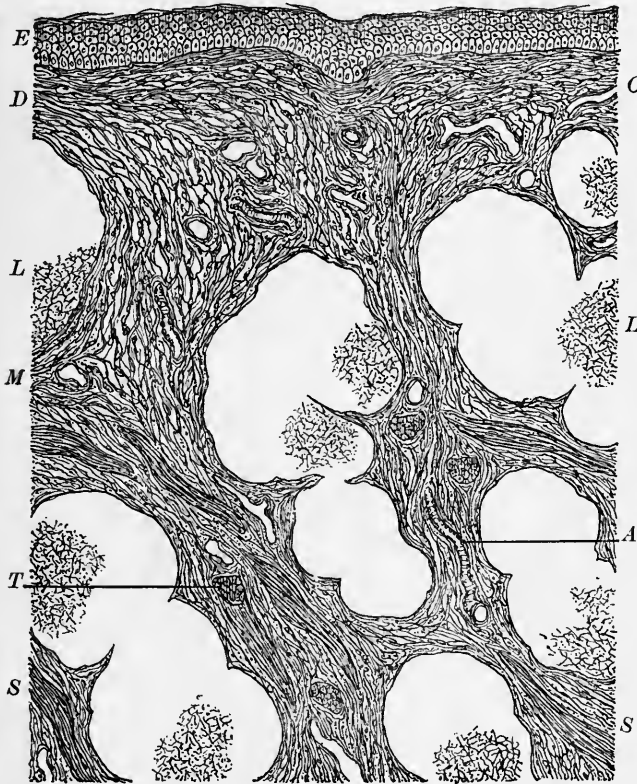
ELEPHANTIASIS VULVÆ.

The disease may affect the entire vulva, or only a part of it: if the growth is limited, which is usually the case, its location is generally the labia majora, next the clitoris; the labia minora are rarely affected. In our climate we seldom see the affection, but in the tropics it is not infrequent. Sometimes these tumors attain an enormous size, reaching in weight from twenty to thirty or more pounds, and extending down to the knees. As a rule, they are attached by a broad base, but they may be pedunculated. Several cases are reported of congenital elephantiasis, but this is exceptional. Nahde's case showed a few red spots on the labia majora at the time of birth. When the infant was six weeks old the growth was as large as a pear, and at fifteen weeks it was as large as a child's head. The most frequent period of development of acquired elephantiasis is between the ages of twenty and thirty years, but the disease may occur at any time.

Pathology.—Histologically several varieties of this disease occur, but they all have one element in common,—namely, a change in the lymphatic circulation. The lymph-vessels are dilated and indurated from the beginning. There are repeated attacks of lymphangitis, which ultimately

result in a hyperplasia of the entire derma and subcutaneous connective tissue. In some cases (L. Heitzmann) microscopical examination does not reveal enlargement of the papillæ nor increase of epithelium. In so-called soft elephantiasis the superficial structures are prominently myxomatous; the deeper layers are myxo-fibrous, with various stages of transition from one tissue-form to the other. The lymphatics are very numerous and dilated and at places cyst-like, so that one might speak of them as lymph-angiomata. They are partly empty and partly filled with

Fig. 4.

Elephantiasis of labium majus, or myxo-lymph-angioma, $\times$ 100.—E, stratified epithelium on surface; D, dense myxo-fibrous tissue beneath epithelium; M, myxo-fibrous connective tissue; S, S, smooth muscle-bundles, in longitudinal section; T, bundle of smooth muscle-fibres, in transverse section; A, artery; C, capillary blood-vessel; L, L, lymph-vessels, partly filled with coagulated fibrin.

lymph-corpuscles, between which a delicate net-work of coagulated fibrin and varying quantities of coagulated, finely granular albumen are recognizable.

The myxomatous and myxo-fibrous structure is largely saturated with a sero-albuminous fluid, which exudes in large quantity when the tumor is cut into. The blood-vessels consist principally of much enlarged capillaries, and are scarce. Their endothelia, as well as those lining the walls of the lymphatics, are unusually large.

In the hard tumors, delicate fibrillated connective tissue predominates and muscle tissue is scanty, whereas the latter is abundant in the myxomatous variety. The lymphatics, although dilated, are not increased, but the blood-vessels are numerous, especially the arterioles. The capillaries are not dilated; numerous nests of inflammatory corpuscles are conspicuous, especially around the arterioles. There exist combinations of tissues. When inflammatory changes with new formations occur first in the superficial layers predominating in the papillæ, that form of tumor is produced which strongly resembles the large coalescing condylomata sometimes found in pregnant women.

The large tumors are liable to extensive ulceration from local irritation, so that they may occasionally give rise to difficulty in diagnosis. The warty form, besides being a source of great annoyance from the accumulation of repulsive secretions, may undergo malignant degeneration.

Fig. 5.

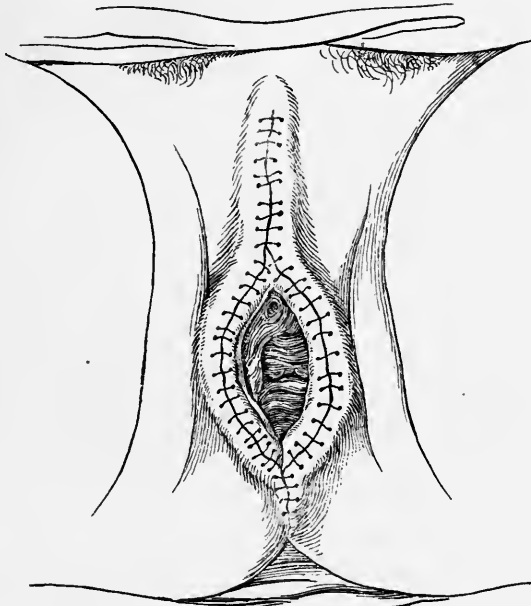Elephantiasis of vulva, before operation. (Schroeder.)

Etiology.—The causative factors are quite numerous, but all hinge on the same principle,—a local irritation. Thus, syphilis, traumatism, local inflammation, as pruritus, eczema, or recurrent attacks of dermatitis, may be enumerated; but any of these conditions must produce an inflammation and obstruction of the lymphatics in order to give rise to elephantiasis. The direct cause is considered to be the presence of a parasite, the filaria sanguinis hominis, in the blood and lymphatics of the parts affected.

Symptoms.—The invasion of the disease is marked by local inflammation, which ceases later, when the tumor has attained a moderate size.

The growth does not annoy the patient until it has reached a size sufficient to produce inconvenience and pain by reason of its weight. Tumors which reach to the base of the urethra usually produce incontinence of urine. Verrucose or papillary tumors are especially annoying because of secretions accumulating between the projections of the papillæ. Ulcerations, although not infrequent, have a tendency to heal spontaneously if the parts are kept clean. In some cases very large quantities of sero-albuminous fluid exude from the neoplasm, necessitating frequent changes of clothing and the wearing of napkins. Eventually the general health of the patient will become more or less undermined, according to the amount and kind of discomfort caused by the tumor.

The prognosis as to longevity is good, although the tumors, when once established, never disappear spontaneously. They seldom recur if excised. The inguinal glands are always enlarged.

Fig. 6.

Elephantiasis of vulva, after operation. (Schroeder.)

Diagnosis.—If the pathology is borne in mind the diagnosis can readily be made. As stated under the head of etiology, frequent attacks of local inflammation mark the beginning, which cause the derma to be very much thickened, and consequently large condylomatous tumors which might otherwise be mistaken for the products of elephantiasis are distinguished from them by the presence of normal skin around the base of the condyloma. Ulcerated tumors may be mistaken for malignant growths and hypertrophic lupus. The microscope will aid in deciding the question if the clinical history alone is not satisfactory. The characteristic forms of

the latter diseases as compared with elephantiasis should be sufficient. We must not forget, however, that one variety of elephantiasis may become carcinomatous: hence when we find a warty tumor ulcerating it is well to be on our guard.

Treatment.—All medicinal treatment has thus far proved futile. The same may be said of the galvanic current, which has nevertheless been favorably mentioned by some authors. The only rational treatment is surgical, and the operation is neither difficult nor dangerous.

With a sessile growth it is best to proceed as was done in the case illustrated,—to incise all around the base of the growth, then to cut it out step by step, uniting the wound immediately with deep sutures.

VULVO-VAGINAL CYSTS, CYSTS OF BARTHOLIN'S OR DUVERNEY'S GLAND.

The Bartholinian glands belong to the racemose variety, and are analogous to Cowper's glands in the male. They are situated on either side of the introitus vaginæ, one on each labium majus. They are about the size of a bean, are shaped like an almond, of a yellowish-red color, and are plentifully surrounded by fibrous connective tissue. Their excretory ducts are about two centimetres long, open immediately in front of the hymen or carunculæ myrtiformes, and admit a very fine probe. They secrete a mucoid fluid, which during sexual excitement is increased and is thrown out in small jets by the action of the constrictor vaginæ.

Cysts of the ducts and cysts of the gland proper may exist; the tumors of the former variety are usually smaller than those of the gland and are of an ovoid shape. The duct-cysts, when they have attained the size of a hazel-nut or larger, cause much inconvenience. Sometimes some of the contents of the cysts may escape through the opening of the duct, if this is pervious, but it soon fills again.

The retention-cysts of the gland proper are similar to the duct-cysts. I have seen one as large as a duck's egg, rendering coitus impossible and the attempt painful. It is, however, not unusual for an active inflammation and suppuration of the cysts to take place subsequently. As a rule, the affection is unilateral, and in my experience one side is just as liable to be affected as the other, although the majority of writers state that these tumors are most frequently found on the left side. The contents of these cysts may vary, in different cases, from a thin limpid fluid to one of viscous character, which at times may have a chocolate hue, due to the presence of blood.

These cysts may be caused by unclean habits in the patient, or by the closure of the duct by inflammatory processes about the introitus, especially gonorrheal inflammation; and in the course of the latter affection it is not uncommon to find small pointed condylomata protruding into the duct. The gonorrheal poison may remain in the mouth of the duct for a long time and be a source of infection. This is readily ascertained by examining a case of vaginitis, cleaning off the secretion with a little absorbent cotton,

and noticing the mouth of the gland, which is surrounded by a small red zone of inflammation: upon making gentle pressure upward along the course of the gland, a small drop of pus will usually be found to exude.

Vulvo-vaginal abscess may also be caused by excessive indulgence in coitus, especially during menstruation, when the staphylococci have easy access to the hyperæmic gland.

The inflammation of the duct may be continuous with that of the gland and so intense as to enhance suppuration. Primary inflammation of the gland is, in my experience, more frequently due to traumatism than to an extension of vaginitis. Should suppuration follow inflammation, the pus may be absorbed and a cystic cavity be left, with viscid contents.

Diagnosis.—Pudendal hernia and hydrocele of the round ligament are the two important conditions from which vulvo-vaginal cysts must be distinguished.

Hernia is reducible, and gives a distinct impulse when the patient is requested to cough: its feel to the examining finger is not so elastic as is the case in cysts. Hydrocele of the round ligament is also partially reducible, gives no impulse on coughing, to the touch has rather a doughy feel, and causes a more diffuse swelling. Cysts are distinctly elastic to the touch, are irreducible, circumscribed, and of ovoid form. They cause no pain unless inflammation sets in, grow slowly, and the percussion-sound is dull; whereas the appearance of a hernia is sudden, and, if an enterocele, resonance on percussion is elicited. We must, however, bear in mind the possibility of there being fluid in the hernial sac: should this be the case the diagnosis is rendered more difficult. When suppuration has taken place, either primarily or supervening upon the inflammation of a cyst, the symptoms are those of an ordinary abscess,—increase in volume of the tumor, intense pain, redness, œdema, fluctuation, etc.

Treatment.—As previously noted, cysts, when emptied, rapidly refill, so that a more radical course must be adopted. They may be incised at the junction of the skin and the mucous surface within the free edge of the labium, and, after evacuation of the contents, the sac wiped out with tincture of iodine or a ten-per-cent. solution of chloride of zinc, then packed with iodoform gauze. The cavity is to be cleansed with a mild solution of carbolic acid every day and lightly repacked. It is desirable to remove a portion of the sac wall after having incised the cyst. This procedure is absolutely certain in its results, and, although somewhat tedious, is the best to follow, provided the cyst cannot be enucleated *in toto*, which is usually a difficult undertaking, because it is generally adherent and ruptures before completion. To facilitate the total extirpation of the sac wall, Pozzi punctures the cyst with a trocar, as in hydrocele, after having incised the integument, washes it out with hot water, and then fills the cavity with liquid paraffin at a low temperature. When the cavity is distended, a cold application is applied to harden the paraffin, and after the lapse of a few minutes the enucleation may be undertaken. If the extirpation has been

completely made, the cavity should be closed entirely with deep sutures. Catgut or silk may be used. I prefer superimposed silkworm-gut sutures in two rows. Both rows are brought out on the skin. The first row is placed at the bottom of the cavity, and the ends are not tied until the second row has been placed at half the depth between the previous stitches; when all have been inserted the sutures are tied, the deep row first. Care must be taken not to insert the sutures too close together, so as to avoid strangulation. A little flexible collodion is applied over the wound. The sutures are removed after five days, when the wound will be found healed. Another form of treatment in vogue is to empty the cyst with a fine aspirating needle, and then to inject the cavity with tincture of iodine or ten-per-cent. solution of chloride of zinc, so as to cause adhesive inflammation. This is bad treatment, and should not be resorted to. When suppuration has occurred, the abscess must be widely opened, washed out with full-strength peroxide of hydrogen, and lightly packed with gauze. This cleansing and packing are to be repeated daily until the cavity has become obliterated. One should not waste time with cataplasms and waiting for spontaneous opening.

Besides the cysts of Bartholin's gland, we meet with sebaceous cysts in the labia majora: these are superficial, and in every respect resemble the ordinary wen. Other cysts which have no connection with Bartholin's gland may occur on different portions of the vulva: their contents are usually clear serum. Dermoid tumors have been encountered, and Taylor described a pedunculated cholesterin tumor. The diagnosis is somewhat difficult as soon as the tumor becomes tense; in some cases the insertion of a hypodermic needle will be necessary to aid in the diagnosis.

The treatment must be on the same plan as that described for the cysts of Bartholin's gland.

Chondromata are exceedingly rare. Schneevogt describes such a cartilaginous tumor (pedunculated) of the clitoris, as large as the fist, in a woman fifty-six years old. Bartholin cites the singular case of a prostitute who had on the clitoris a growth of this nature, which was ossified to such an extent that men who had coitus with her had abrasions produced on the penis.

Neuromata are even more rare. Simpson reported the only case which is not open to doubt. It was a small painful nodule near the meatus urinarius.

VARICOSE TUMORS—VARICES.

Such tumors may occur as the result of pressure of a pathological or a physiological growth in the pelvis; pregnancy is the usual cause. I have seen a bunch of distended veins, as large as the two fists, on the right labium majus, in a woman in the fourth month of gestation. The patient died subsequently from sepsis the result of a suppurating hæmatoma. The distended veins are readily recognized, and can hardly be mistaken for any

other condition. As a rule, they cause very little inconvenience except that consequent upon physical exertion; but they are nevertheless no inconsiderable source of danger in consequence of their great distention during parturition, especially if, during the passage of the head, the varix ruptures externally or subcutaneously. Traumatism or unusual physical exertion may cause the rupture of a varix at any time, and, if exteriorly, such profuse hemorrhage may occur as to cause death. Varicose veins on the thighs and legs generally are associated with varices of the vulva.

The treatment, if the varicose tumor is due to pregnancy and is large, consists in keeping the patient in the horizontal position as much as possible, and in having her wear a well-fitting abdominal supporter to take the pressure off the pelvic vessels. If the tumor has attained an unusual size, as in a case reported by Holden, in which it was as large as an infant's head, the production of abortion should be taken into consideration. If pelvic tumors cause the venous dilatation, they should be removed.

Hæmatoma usually results from the subcutaneous rupture of a varix. Outside of pregnancy, vulvar hæmatoma occurs only as the result of traumatism. That resulting from parturition sometimes attains a very large size. It must be considered a grave complication of the parturient state if the hæmatoma is large or even of medium size. Small hæmatomata, as a rule, become absorbed, and even with large blood tumors it is advisable to let nature take her course and give them a chance to disappear; but should suppuration take place and the symptoms of septicæmia manifest themselves, the tumor should at once be widely opened, evacuated, and the cavity packed with iodoform gauze. Hæmatoma cannot be mistaken for any other enlargement: its characteristic violet color, with the history of sudden appearance, is sufficient to establish the diagnosis.

POLYPI.

Polypoid growths of the meatus urinarius are not of rare occurrence: they are usually pedunculated, and are very vascular, and hence appear crimson or purplish-red to the eye. Their vessels are not greatly dilated, nor their walls thickened, as in telangiectasis; nevertheless, they sometimes bleed repeatedly and profusely. The growths vary in size from that of a pin-head to that of a hazel-nut; being of a myxomatous or myxo-fibrous structure, they are usually soft to the touch. They are very painful, and cause much trouble in micturition, so that their symptoms strongly resemble those of cystitis: hence it is necessary to examine the urethra in cases presenting such symptoms by making pressure upon it in a forward direction, towards the orifice of the meatus, with a finger in the vagina, when the small growth hidden within will generally be brought to view. If the growth is pedunculated, so that a catgut ligature can be thrown around it, it may be cut off above the ligature, or it may be at once excised and the bleeding stopped with a fine suture of catgut. A five- or ten-per-cent. solution of cocaine should be used as a local anæsthetic.

LUPUS.

Guibourt and Huguier first described this affection, under the name of *esthiomène*. It is rare, and its occurrence is usually between the ages of twenty and thirty years. Clinically we distinguish two forms, the hypertrophic and the ulcerative, and the latter has been subdivided into several varieties.

The disease is of very slow growth and is difficult to cure. The patient from whom the photograph was taken was finally cured after complete excision of the neoplasm, all other treatment having failed.

FIG. 7.

Ulcerated form of lupus, four months after the beginning of the disease.

The cause of the disease is, as demonstrated by the discovery of A. Pfeiffer and Pagenstecher, a local infection with tubercle-bacilli. Clinicians long ago suspected tuberculosis of being an etiological factor in the production of the disease. A peculiarity of lupus is that some parts after having ulcerated begin to cicatrize; this forms one of the distinguishing features from dermoid cancer of the vulva, with which it may possibly be confounded. Pain is seldom present, whereas it nearly always accompanies cancer. Lupus also differs from epithelioma by the absence, as a rule, of enlarged lymphatics in the former.

Microscopical examination (Fig. 8) reveals either considerable hypertrophy of the superficial layers of connective tissue and their papillæ,

together with an acute infiltration with inflammatory corpuscles in scattered nests, constituting hypertrophic lupus, or loss of substance in both the epithelial and subjacent connective-tissue layers, together with considerable infiltration with inflammatory corpuscles,—ulcerative lupus. The essential feature is, however, the lupus nodule, an aggregation of inflammatory corpuscles in cheesy or colloid degeneration. Nests of such corpuscles completely lack blood-vessels, which are abundant both around the nodule and

FIG. 8.

Lupus of vulva, × 250.—*E*, epidermis; *P*, inflamed papillæ in transverse section; *R*, rete mucosum, inflamed; *U*, ulcer on surface; *F, F*, fibrous connective tissue in inflammatory infiltration; *B, B*, remnants of bundles of fibrous connective tissue; *C, C*, blood-vessels, mostly dilated; *N, N*, lupus nodules, non-vascular.

in the hyperplastic tissue some distance away from the nodule. Tubercle-bacilli are always scanty in the lupus nodule.

Treatment.—If possible, the growth should be completely excised with curved scissors. When this is not feasible, gouging with a sharp curette must be resorted to, with subsequent application of the actual cautery or strong caustics.

CANCER OF THE VULVA.

Primary cancer of the vulva is a great rarity, the majority of cases being instances complicated with malignant disease of the vagina or of the

uterus, or of both.   Martin reports a primary cancer of Bartholin's glands
in a patient seventy years old.   Cancer of these glands may be of very slow
progress, as in Schweizer's case of three years' standing, the patient being
alive at the time of the report.   The most prevalent form is dermoid cancer
or epithelioma (Fig. 9), and the inner and lower part of the labium majus
is its predominating situation : it may, however, also originate from the
clitoris, selecting its prepuce for the primary seat, or from the urethral
orifice.

· **Pathology.**—The most characteristic feature of dermoid cancer under
the microscope is the thickening of the epithelial layers, with a pronounced
growth into the depth, whereby the papillæ are likewise enlarged.   The
epithelia produce ingrowths, which frequently are interconnected, resulting
in a plexiform arrangement.   In the interior of these, as well as inde-
pendently, the epithelia become arranged in concentric layers, retaining their
flat form.   Thus onion-like layers are produced, which are termed cancer-
nests.   In the midst of these nests the epithelia coalesce, forming masses
of high refraction, owing to a colloid degeneration,—the so-called cancer
pearls.   Aside from these new epithelial formations, the subjacent connec-
tive tissue is found transformed into globules closely resembling those of
inflammatory infiltration.   Virchow terms this condition the small cellular
infiltration ; Waldeyer, the inflammatory reaction.   C. Heitzmann considers
this infiltration the incipient stage of cancer, since he has proved that from
the globules new epithelia will arise.   The more pronounced this infiltra-
tion, the more malignant is the type of cancer.

Etiology.—There is nothing definitely known as to the causation.
Advanced age predisposes towards the formation, so that it is most fre-
quently met with between the ages of forty and sixty years ; but it may
occur at any time of life, even during childhood or very old age.   Mundé
reports an epithelioma of the vaginal fornix at twenty-four years, but
it has been found as early as five years and as late as beyond seventy.
Traumatism and frequently recurring attacks of vulvitis may lead to it.
Chronic eczema leading to a thickening of the mucosa of the labia in
scattered patches, the so-called kraurosis of Breisky, is a predisposing cause
of epithelioma.

Symptoms.—It begins in the form of small, hard, round, irregular
nodules slightly elevated above the skin, which are covered with thick
layers of scaly epithelium ; these in the early stage are of slow growth and
occasionally produce no symptoms ; usually, however, pruritus vulvæ of
greater or less intensity is present.   This stage may last several months.
Later, when these nodules have attained a larger size, they begin to secer-
nate, owing to a greater blood-supply in their vicinity.   Soon the epithe-
lium becomes denuded, and superficial ulceration is the result ; now the
growth is more rapid, and the inguinal glands become involved, these
sometimes attaining an enormous size, as in the case reported by Schuh, in
which the conglomeration was as large as an infant's head.   Pain, which in

FIG. 9.
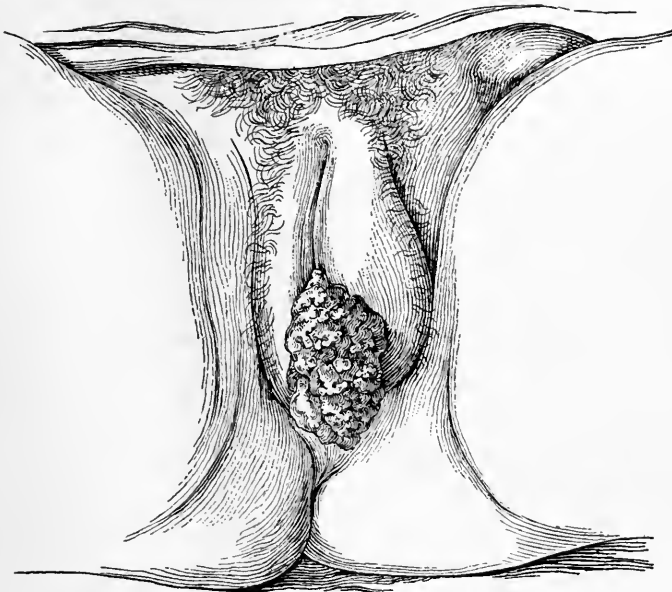
Dermoid cancer or epithelioma of left labium majus.   (Kaposi.)

FIG. 10.
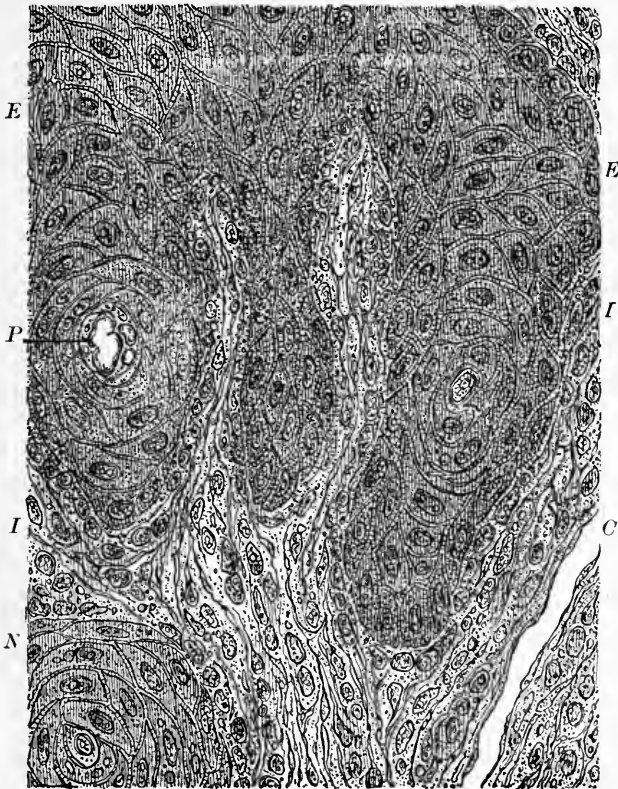
Dermoid cancer or epithelioma of labium majus, × 500.—*E, E*, epithelial plugs, penetrating into the derma; *N*, epithelial nest; *P*, cancer pearl; *I, I*, connective tissue crowded with protoplasmic bodies; *C*, capillary blood-vessel.

the beginning was absent, now frequently becomes a prominent symptom, although some patients complain very little. The borders and base of the ulceration are uneven, hard, and livid. The usually sero-purulent secretion has a very disagreeable odor. Upon pressure, small plugs will appear at the base, which are the epithelia in fatty and colloid degeneration and should not be mistaken for pus. Pressure, however, should always be exerted gently, since Gerster has enunciated the plausible view that by pressure the cancer epithelia are detached and driven into the lymphatics, thus causing a more rapid propagation of the disease, especially in the adjacent lymph ganglia. Hemorrhages are infrequent and seldom of large quantity. It is as unusual for the disease to pass to the other labium by contiguity as it is for it to occur simultaneously on both labia, but the epithelioma does spread to the perineum, and even to the thighs, the vagina, the bladder, and the rectum.

The patients finally die of marasmus, superinduced by a low but continuous septic infection, in from two to five years after the initiatory nodules are noticed.

Medullary cancer and scirrhous cancer are of still greater rarity as primary neoplasms in this locality, and are of decidedly graver prognosis. The symptoms noted for epithelioma also occur in these forms of malignant diseases, only in more rapid succession and with greater intensity.

Diagnosis.—The microscope will settle the diagnosis in all cases, and it should be invariably called in as an aid. Syphilis and ulcerating lupus may be mistaken for epithelioma, but the history is so very different, and the symptoms are so unlike, that with a little care such errors should be avoided.

SARCOMA.

Sarcoma (or myeloma) is the least prevalent of the malignant diseases of the vulva, and occurs as melanotic sarcoma. (Fig. 11.) The symptoms are similar to those of other varieties of malignant disease, with the exception that sarcomata very rarely ulcerate, whereas ulceration is an essential feature of cancer. The adjacent lymph ganglia are only exceptionally affected in sarcoma, whereas in cancer they almost invariably become enlarged and infiltrated.

Pathology of Sarcoma (Myeloma) (Fig. 12). — This type of tumor, before Virchow's time, was termed encephaloid, the same term being also applied to rapidly growing medullary cancer. Virchow was the first to call attention to the fact that cancer is mainly an epithelial growth, and sarcoma a connective-tissue growth, this tissue being in an embryonal or medullary condition. Such tumors are made up either of lobular or of spindle-shaped elements, often of the two intermixed, and either white or more or less saturated with a brown or black granular or diffuse pigment. The structure of sarcoma is uniform, and, as Billroth has shown, may exhibit an alveolar structure somewhat resembling that of cancer, though lacking epithelia; the blood-vessels are always scanty. In melanotic sarcoma

deposits of a dark granular pigment may be seen in the layer of epithelia covering the tumor, or in the thin framework of fibrous connective tissue surrounding the alveoli, or in the multiform bodies filling the alveoli.

The prognosis is still more serious than in cancer, since it destroys life usually within two years. The microscope alone can determine with certainty with which form of disease we have to deal.

Treatment.—The diagnosis having been made with certainty, there is but one method to pursue in either of these forms of malignant neoplasm which will offer any chance for the life of the patient, provided that the disease has not already progressed too far for its adoption. The new growth must be completely removed. The only question is which method should be employed, the knife or the galvano-cautery. It is asserted that

Fig. 11.
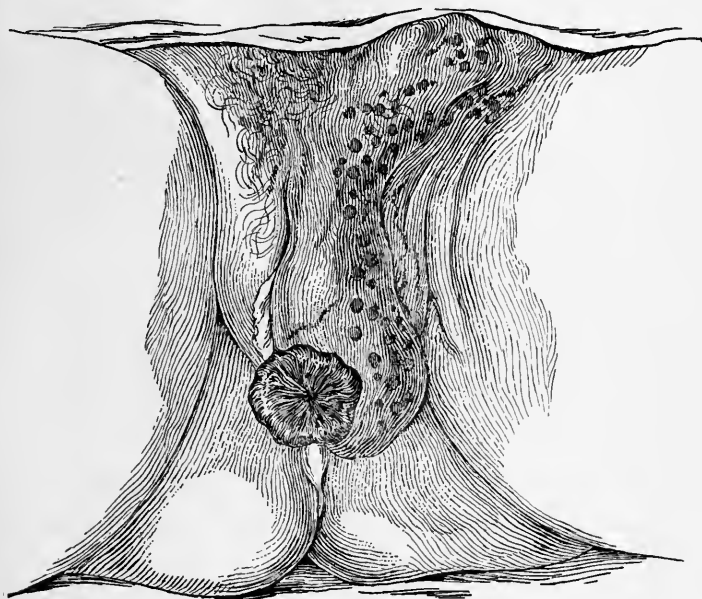
Melanotic sarcoma of left labium majus. (Kaposi).

with the latter there is less danger of hemorrhage; but any one who undertakes such work must be competent to manage a bleeding surface, and if the operation is done with dexterity and rapidity with the knife and scissors the hemorrhage should not be very great; while the advantage is that we are likely to obtain union by first intention. Care should be used to operate sufficiently far in healthy tissue to insure annihilation of the disease, since it has been proved that the slightest trace of the so-called inflammatory infiltration of the connective tissue left at the cut surface is enough to produce a recurrence. The entire chain of lymphatics on the corresponding side should also be removed on the slightest evidence of enlargement. Great care must be taken in restoring the meatus urinarius if

the neoplasm has originated in that locality.   In a patient of mine with melanotic sarcoma, all the lymphatics, though very little enlarged, were removed at the time of operation upon the tumors, and there has been no recurrence up to the present time, three years since the operation.   The use of caustic pastes, or other caustics, after the use of the knife, with the idea of more deeply destroying the neoplasm, is to be deprecated.   If palliative treatment becomes necessary on account of too great advancement, recourse must be had to some method which will stop the ichorous discharge from

Fig. 12.
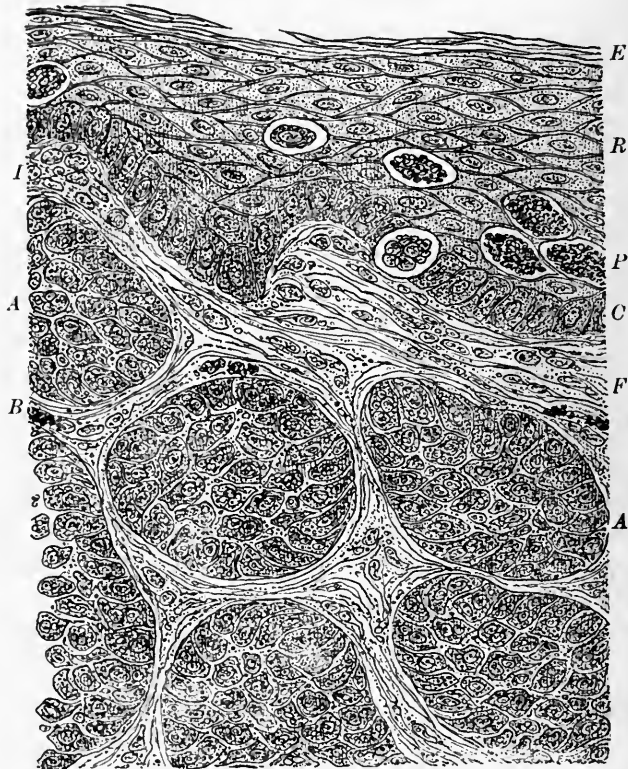
Melanotic alveolar sarcoma of the skin, × 500.—E, epidermis; R, rete mucosum with compressed epithelia; P, pigmented clusters of living matter sprung from epithelia; C, row of short pigmented columnar epithelia; F, fibrous connective tissue; I, infiltration of fibrous connective tissue with protoplasmic bodies; B, black pigment clusters; A, A, alveoli filled with multiform pigmented corpuscles.

the ulcerating surface.   First remove all soft, broken-down tissue with a sharp curette, and then use the actual cautery.   As a dressing, powdered charcoal, or one part of aristol mixed with three parts of bismuth, may be employed.   Lotions of lysol, creolin, or carbolic acid solution are advantageous, and to prevent the clothing from becoming soiled by the secretions an occlusion pad should be worn.   If the pain becomes very severe, narcotics must be used.

The use of pyoktanin blue will be referred to under cancer of the uterus.

CYSTS.

A variety of cystic formation occasionally found during pregnancy has been carefully studied by Winckel and termed by him *kolpohyperplasia cystica*. Zweifel gives the name *vaginitis emphysematosa* to the same condition, and in my opinion this is a better term. The cysts are very small, usually not larger than a millet-seed, and are filled with gas; they produce no symptoms except leucorrhœa, and are therefore of no great importance. What the origin of the gas is we do not know. Their lining is composed of endothelium.

Another form of true cysts is, in my experience, not infrequently found, about the origin of which diversity of opinion exists. As a rule, they occur singly, but several have been found in a row. I have seen two beside each other. Their seat is generally on either the anterior or the posterior vaginal wall, but I have been unable to notice any predilection as to which one, or as to which portion of the vagina, whether the upper, middle, or lower third. They sometimes occur on the lateral walls, but I have seen only two instances in this situation. The tumors vary in size from that of a pea to that of a hen's egg or more, and the mucous membrane covering the cysts often retains its normal appearance; generally, however, it becomes smooth and glossy, owing to the distention of the cyst. Often it is so thin that the cyst looks like a miniature rubber balloon attached to the vaginal mucosa. The growth of these cysts is very slow, and they may require many years to attain the size of a hen's egg. But exceptions occur to this rule, as in a case reported by Hörder, in which the cyst grew rapidly in six months. Their tendency is to grow first towards the lumen of the vagina; when situated in the lower portion, they bulge towards the exit after having attained a certain size. They are sessile, but may become somewhat pedunculated if the base is lax. Their contents vary: sometimes the contained fluid is a clear serum, in other cases it is thick and tenacious, and in still others it is dark red, or rather chocolate-colored, showing the presence of blood.

Microscopically we find fat, epithelium, granular corpuscles, blood, and pus, some of which may be occasionally absent. The cyst wall is composed of connective tissue, sometimes containing muscle elements, and is lined with epithelium which belongs to either the cylindrical, the pavement, or the ciliated variety, the first mentioned being the most common.

If we follow the histology and give the literature of careful observers due attention, we must come to the conclusion that the origin is not always the same. I lean towards the opinion expressed by von Preuschen, that most cysts originate from glands exceptionally present in the vagina, rendering them retention-cysts. It is also thought by some that they have their origin from the remnants of the Wolffian canal, or canal of Gärtner. This view, enunciated by Veit, is very plausible, and undoubtedly must be accepted for some cases. Retention in dilated lymph-

vessels, and, according to Winckel, traumatism, may be mentioned among the causes.

Symptoms.—Unless the growths are larger than a hazel-nut, they are not likely to cause any symptoms; and if symptoms are present they will depend greatly upon the situation of the cyst, as well as its size. When the cyst becomes inflamed and suppuration takes place, considerable pain will be felt, as in any other inflamed part. The larger cysts, when situated on the anterior wall and in the middle or lower third of the vagina, cause vesical disturbance, a dragging sensation, sometimes descent of the vaginal wall, impressing the patient with the feeling of having prolapsus uteri, leucorrhœa, discomfort in walking, hinderance to coition, and if situated in the upper third they may be a cause of sterility. On the other hand, a case is known in which a vaginal cyst in a virgin was ruptured on first intercourse after marriage, a great part of the ruptured cyst wall being torn off and discharged. If on the upper part of the posterior wall, these cysts may cause antedisplacement, thus giving rise to the usual train of symptoms caused by anteflexion or version. Some of these symptoms may be absent, or in some aggravated cases all may be present. Cysts of unusually large size may cause an obstruction to parturition. Veit's case is probably the largest cyst ever observed,—viz., the size of an infant's head.

The prognosis is favorable for cure if they are properly treated. They do not endanger life if left alone, but expectant treatment should not be adopted if they are of sufficient size to cause symptoms and if the patient will submit to an operation.

Diagnosis.—This should never cause any difficulty, but some very amusing errors have occurred; for instance, they have been mistaken for prolapsus, and so treated. Rectocele and cystocele are readily differentiated, if not at once by the appearance and character of the tumor, by touch, certainly by a rectal examination in the former instance, and in the latter by the introduction of a catheter into the bladder. The same point of distinction holds good for peri-urethral cysts.

Vulvo-vaginal cysts are recognized by their location. Incomplete closure of Müller's ducts may give rise to an error only on superficial examination without operation; the bifidity of the vagina usually extends to the vulva, and produces a distention the peculiarity of which is that it can be palpated along the whole lateral wall of the vagina. Operation will of course at once dispel all errors.

Vaginal hernia will, on coughing, give an impulse to the finger; besides, a hernia can be reduced. It should be borne in mind that cysts are generally circumscribed, and have tense walls and an elastic feel. If one is in doubt, the introduction of a hypodermic syringe needle and withdrawal of some of the fluid will certainly dispel it, should the other diagnostic signs be insufficient.

Treatment.—Simple puncture or incision is useless, as the cysts always refill; and the injection of tincture of iodine or any other irritating fluid

after puncture, although it may lead to a cure, should not be used for the purpose of causing adhesive inflammation and thus obliteration of the sac, since the gain is not worth the risk of producing a severe inflammatory reaction and suppuration, and in many such cases no cure results from this procedure. For small and medium-sized cysts I have always practised complete enucleation, and this can be done even with large cysts, or if a portion of the projecting part of the cyst be cut out with a pair of scissors and the cavity packed with a strip of iodoform gauze it will also invariably result in a cure. This is especially preferable in large cysts where there is reason to expect considerable hemorrhage, and also in cysts which are in the upper part of the vagina and in those which lie deep, near the urethra or the bladder. It is not necessary to unite the cyst wall and the vaginal mucous membrane, as Schroeder has advocated and as is now extensively practised. This procedure usually requires anæsthesia, whereas cutting out a small piece and packing the cavity can be quickly done without anæsthesia. Strict cleanliness must of course be observed.

FIBRO-MYOMATA—POLYPI.

The latter are exceedingly rare, although a few cases have been observed. Martin has seen one in an infant one day old. In more than thirty thousand gynæcological cases examined by me I do not recall a single instance of fibrous polypus of the vagina.

No period of life is exempt from vaginal fibro-myomata, although they occur most frequently during the period of sexual activity. Their histology is similar to that of fibro-myomatous tumors of the uterus, and the reader is referred to the section on this subject for the description. Only one case of a tumor composed entirely of purely connective tissue is on record. In all other cases of vaginal polypi thus far observed the tumors have been composed of connective tissue with muscular structure. Their size varies from that of a pea to that of a mass ten pounds in weight, the majority of observed cases, however, being small. Their usual seat is on the upper and anterior wall. When the growths are larger, weighing a pound or more, they may ulcerate, and then strongly resemble sarcoma. This, however, is the only neoplasm with which they may pardonably be confounded, and the microscope alone will in some such instances give a solution. To diagnose sessile tumors from vaginal cysts may require an exploratory puncture.

The symptoms will vary with the location and size of the growth. Leucorrhœa will be the first noticeable. The larger tumors cause vesical and rectal disturbance, dragging sensations, and hemorrhage when the surface is ulcerated, and form obstacles to coition and parturition.

Treatment.—This can consist only of removal. In sessile tumors the vaginal mucosa should be cut nearly at the base of the growth and surrounding it, so as to get rid at the same time of superfluous structure. When the growth is enucleated, continuous catgut sutures are used to close the bed, care being observed to include the bed of the growth in the

suture. Pedunculated growths are removed with the ligature and knife or scissors.

CANCER OF THE VAGINA.

It is even more rare to find the primary seat of this neoplasm in the vagina than to encounter it on the vulva. It is generally found as a continuation of carcinoma of the portio vaginalis. In other instances it is associated with cancer of the vulva. It may occur at any period of life, even in childhood, as is shown by a specimen obtained from a child nine years old, in the pathological museum of Strasbürg. The greater number of cases, however, occur between the thirtieth and the fortieth year.

It usually appears in one or other of two different forms. The broad-based papillary form generally has its origin on the posterior wall. These epitheliomata may attain such a size as to block up the vagina, and in the case of the child referred to above the epitheliomatous tumor was as large as a hen's egg. In other cases they occur as small isolated nodules or small ulcers with an indurated base, which rapidly become confluent and involve the whole vaginal circumference. This latter form varies in type histologically, sometimes being of the epitheliomatous, but usually of the medullary, and least frequently of the scirrhous variety.

We sometimes find it occurring as a complication of pregnancy, and it may then form an obstacle to delivery. The course of the disease is usually quite rapid, obviously owing to the fact that these tumors are generally recognized too late, whence the extremely bad prognosis as to cure. Unfortunately, the neoplasm in this situation seldom causes symptoms which attract the attention of the patient in its early stages. When the disease is discovered, disintegration has usually commenced, causing disagreeable vaginal discharges, and hemorrhage in greater or less amount, especially after coitus; in fact, the initiatory hemorrhage generally occurs subsequently to that act. Pain seldom is present until late, when the new growth has involved some deeper structures. Rectal and vesical symptoms appear according to the extent and situation of the disease. The most characteristic feature for clinical diagnosis is the induration surrounding the ulcer, provided one is already present; its indurated base can also readily be appreciated, as well as its ready bleeding under slight manipulation. If no ulcer is present, the peculiar induration alone should be sufficient. I have never met with any other pathological condition which simulated the unyielding induration of malignant disease. The only neoplasm which can be confounded with cancer is sarcoma: here the microscope must differentiate.

Treatment.—Extirpation of that part of the vagina involved is the only method which holds out a ray of hope; but even with this procedure I do not know of a case in which recurrence has not taken place, though unquestionably in some the incision was made in apparently perfectly healthy tissue; in most instances, however, the patients come under our care too late for radical operation. Why it is that cancerous infiltration of

the vaginal walls contiguous to carcinoma of the cervix, after resection of the uterus and vagina, should give a better final prognosis than when the cancer has its origin in the vagina, I am unable to say, but clinically such seems to be the case. I have resected the upper half of the vaginal pouch in two such instances, and a good portion in several others, with fair result; in one, two years have elapsed without a recurrence.

Owing to the great laxity of the vagina, we can usually approximate the cut surface with a continuous catgut suture and thus obtain primary union. The operation should be done under continuous irrigation, which keeps the field for work clearer and more antiseptic than sponging. When the disease has advanced too far for the radical operation, the course of treatment advised for malignant disease of the vulva should be pursued.

SARCOMATA.

These also occur in two varieties, as diffuse sarcomatous infiltration and as the circumscribed tumor sometimes clinically resembling a fibroid polypus. The differential diagnosis can, of course, be established only with the aid of the microscope. Histologically, spindle-celled or fibro-sarcoma, round-celled, melanotic, and medullary sarcomata, have been reported. No age is exempt, and the prognosis and treatment resemble those of the previously-discussed neoplasm. Only one authenticated case is on record which was seemingly permanently cured, that of Spiegelberg, in which four years subsequent to the operation there had been no indication of recurrence.

CHAPTER XI.

BENIGN NEOPLASMS OF THE UTERUS.

BY HERMANN J. BOLDT, M.D.

MYXOMA.

ALL so-called polypoid tumors of a jelly-like consistency and half translucent to the naked eye appear under the microscope to be made up mainly of myxomatous tissue. They originate in any portion of the uterine mucosa, most frequently in the cervix. They are analogous to the mucoid polypi of the nasal and pharyngeal cavities, their vascular supply being greater in the uterus than in the above-named localities. Originally the tumors are sessile, but with advancing growth they become pedunculated, frequently protruding through the os and there appearing as bluish or purplish-red lobules. Their clinical symptoms become apparent only after they have attained a certain size, and consist in leucorrhœa, due to endometritis, and hemorrhage, due to bursting of blood-vessels of the tumor or of the hyperæmic endometrium. Pain of a bearing-down character is frequently present. They may also be a cause of sterility.

Myxomatous tumors without complications with other tissues are exceptional. The most common complication is the presence of bundles of smooth muscle-fibres in the trabeculæ of the myxomatous tissue, the so-called myo-myxomata. Still more frequently we meet with a complication of glandular tissue, usually of the tubular type. Ciliated columnar epithelia make up the lining of such tubular glands. These tumors are most frequent in the cervical canal.
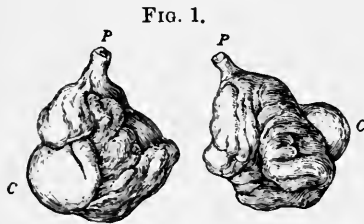

FIG. 1.

Cysto-myxo-adenoma of the cervical canal, or cervical polypi.—*P, P*, pedicles attached to mucosa; *C, C*, cysts.

The addition of the glandular element renders their surface lobulated or corrugated, whereas pure myxoma has a smooth surface. According as the myxomatous or the glandular tissue prevails, the tumors will be termed either adeno-myxoma or myxo-adenoma. Not infrequently myxomatous polypi contain cavities of varying sizes filled with a serous liquid. In pure myxoma such cavities result from partial liquefaction of the tissue, and then we term them hydro-myxoma.

550

If the cavities have originated from the glands and are lined with epithelium, the name of the tumor is cysto-myxoma or cysto-adeno-myxoma.

Treatment.—The removal of these tumors is readily accomplished with scissors and a sharp curette. Subsequent to their removal a local

FIG. 2.
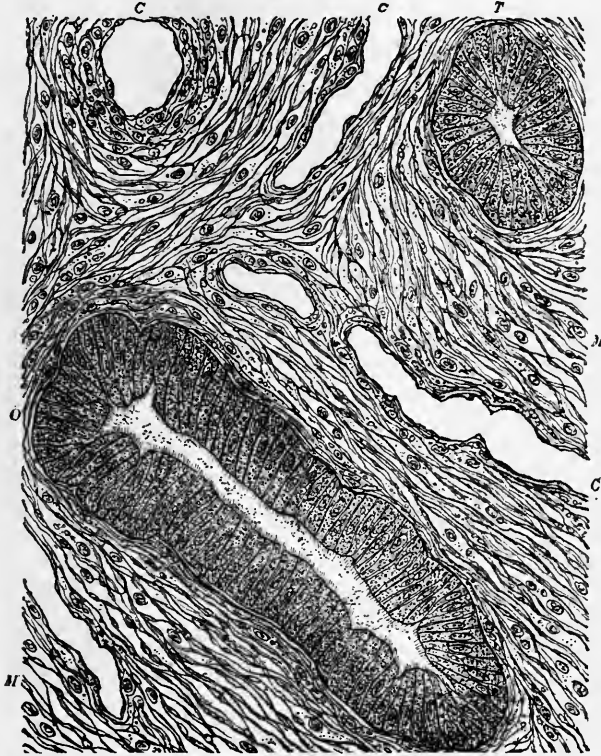
Cysto-myxo-adenoma of cervical mucosa, so-called polypus, × 200.—*O*, oblique section of utricular gland; *T*, transverse section of utricular gland; *M, M*, myxomatous and myxo-fibrous connective tissue; *C, C*, wide capillary blood-vessels.

application of pure carbolic acid to the entire uterine mucosa should be made, on account of the coexisting endometritis. The patient should be kept in bed for the rest of the day of the operation.

CYSTS.

Cysts in the cervical canal are of common occurrence, and are erroneously termed ovules of Naboth. Their clinical significance is but slight, and they require treatment—consisting in snipping the top off the cyst with scissors, or splitting it with a bistoury, with the subsequent local application of tincture of iodine to the interior of the sac—only in cases where endocervicitis or cervicitis is caused by them.

Like all other cysts lined with epithelium, they originate from glandular formations, with an increase in the size and number of the latter: therefore they have an adenomatous incipient stage. The lining of the cyst wall con-

sists, as a rule, of a single layer of columnar epithelium. The contents
are in some cases liquid or semi-liquid, in others a jelly-like mass, in which

FIG. 3.
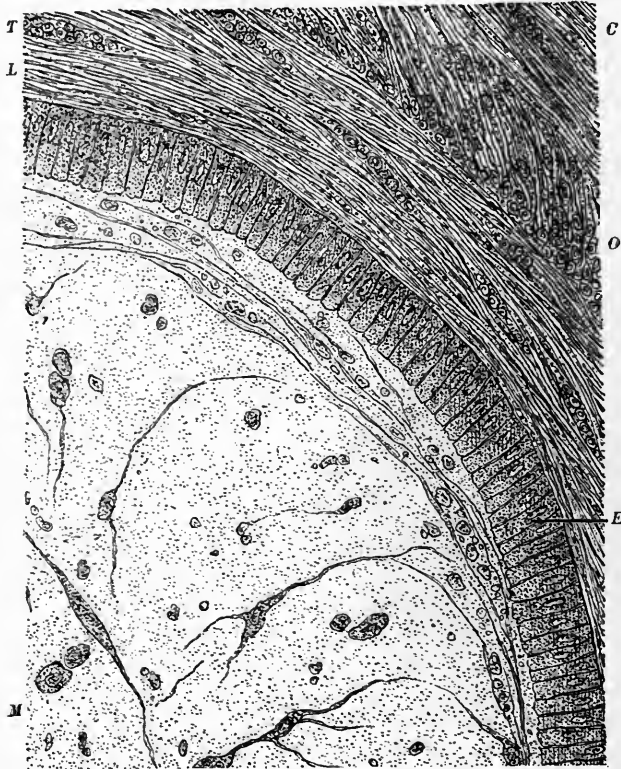
Cystic degeneration of a gland of the mucosa of the cervix uteri, so-called Naboth's ovulum, × 500.
—*E*, columnar epithelium lining cyst; *M*, contents of cyst; *C*, fibrous connective tissue; *L*, smooth
muscle-fibres in longitudinal section; *O*, smooth muscle-fibres in oblique section; *T*, smooth muscle-
fibres in transverse section.

are found embedded or scattered peculiar branching, nucleated protoplasmic
bodies, closely resembling those seen in myxomatous tissue. To call these
cysts simply retention-cysts of the cervical glands is unquestionably erro-
neous; though their formation is not as yet fully understood.

FIBRO-MYOMA OF THE UTERUS.

Myoma, myo-fibroma, fibro-myoma, fibroma, are the terms generally
adopted to designate neoplasms of the uterus which are composed of ele-
ments similar to those composing the normal wall of the uterus. The
name ordinarily employed in this country is the last of the list, but this is
as erroneous as the first, unless in exceptionally rare cases. The desig-
nations steatoma, leiomyoma, hysteroma, and tubercle have been abandoned
by recent authors. The tumors are, as we shall see later, generally of
a mixed variety, composed of muscle and fibrous connective tissue: hence

the corresponding terms myo-fibroma or fibro-myoma, the prefix being applied according as one or the other of the two tissues is the more abundant. However, from a clinical stand-point this differentiation is immaterial, because the question as to the structure in many cases can be settled only by the microscope. This variety of neoplasm is benign : it is not, however, so harmless as older authors considered it to be, and consequently is of far greater importance than was taught by nearly all writers only a quarter of a century ago.

Pathology.—The rule is that these tumors grow slowly, but, as with so many other conditions, exceptions occur. They may be single, the so-called round uterine fibroid, or they may be multiple. If we examine a large number of extirpated uteri which have been the seat of fibro-myomatous tumors, we shall in the majority of cases be able to demonstrate that the latter condition is the rule. They vary in size from a microscopical point,

Fig. 4.

Section of subserous fibro-myoma, posterior surface of uterus.

or from a tumor the size of a pea, to a growth of immense proportions. I have seen one demonstrated by the late Dr. James B. Hunter, in the New York Obstetrical Society, weighing one hundred and forty pounds, which was fifty-five pounds more than the woman weighed after removal of the tumor. Their seat is also variable ; the majority have their origin from the body of the uterus, and of these, again, the greater number are situated in the posterior wall ; they least frequently spring from the cervix. The tumors are classified, according to the relative position which they maintain to their surroundings, into three principal varieties : (1) subperitoneal or subserous, (2) interstitial (or intra-parietal, or intra-muscular, or intra-mural), and (3) submucous fibro-myomata. Very often the growths belong to the category of mixed tumors ; that is, when the growth in question

belongs, on account of its anatomical relation, to two of the above divisions. The subserous variety is formed when the tumor develops near or directly beneath the peritoneal covering of the uterus; it then continues to grow towards the peritoneal cavity, because it there meets with the least resistance. The subperitoneal tumors have been designated peritoneal polypi by Virchow, but it is best to reserve the name polypi for tumors found in the interior of the uterus. The pedicle varies in length and in thickness. If it is thick and is intimately connected with the parenchyma of the uterus,

Fig. 5.
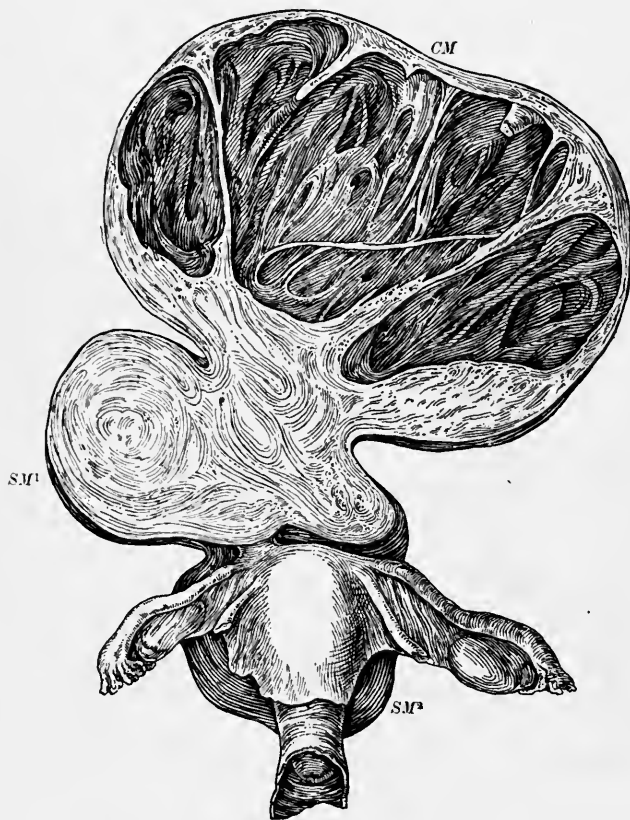
Trilobed fibro-myoma arising from fundus uteri with a thin pedicle.—*CM*, cystic part of tumor; *SM*, subperitoneal solid portion; *SM*², subperitoneal solid fibro-myoma behind the uterus. (Schroeder.)

the growth of the tumor is more rapid than that of tumors connected with a thin pedicle, which sometimes are composed only of the peritoneum (derived from the uterus), subserous connective tissue, and blood-vessels of varying size. A short, thick pedicle at the fundus will draw the organ upward, so that, according to the size of the tumor, it may be difficult for the examining finger to reach the portio; the uterine cavity is often elongated in these cases, but remains of normal length in long-pedicled tumors. It is possible that the uterus may be so much drawn upward that the cervix

becomes thinned out to a thin cord, and it may even happen that complete separation occurs. If for some reason the tumor causes a rotation in such an elongated cervix, hydrometra or hæmatometra is apt to occur; or the pedicle may be twisted the same as in an ovarian tumor and gangrene may set in, or it may be entirely separated from the uterus and may remain perfectly innocuous in the abdominal cavity. Localized peritonitis is not infrequently found, and the neoplasm forms attachments to the surrounding parts, as the abdominal walls, the intestines, or the bladder; the nutriment of the growth may be principally derived from vessels in the adhesions of the surroundings. If the pedunculated growth gravitates into the posterior cul-de-sac, symptoms referable to the bladder and rectum will occur. The

FIG. 6.
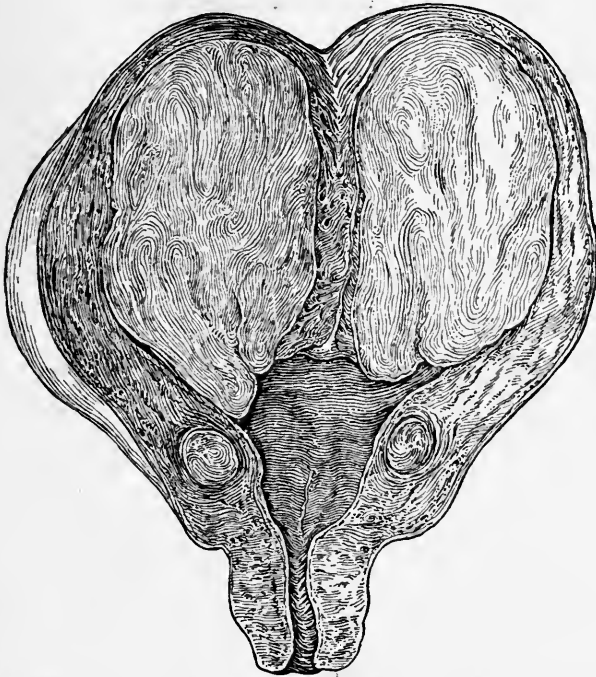
Large submucous and small intra-mural fibro-myoma, one-fourth natural size.

tumor may become adherent by an inflammatory process in the cul-de-sac and thus aggravate such symptoms; then the incarcerated tumor cannot be separated from the uterus. With the tumor on the anterior surface of the womb, that organ is soon retroposed, and we obtain the symptoms of retroflexion in addition to those of anteflexion. Intestinal obstruction may be caused by rotation of a pedunculated tumor adherent to a portion of intestine. The tumors of this class also develop into the folds of the broad ligament, but, fortunately, this is infrequent. The longer and thinner the pedicle the more independent are the movements of the tumor in the abdominal cavity and the greater are the chances that, as the result of local irritation, more or less ascitic fluid will accumulate in the peritoneal cavity.

Submucous fibro-myomata are generally entirely covered with mucous membrane, the mucosa being identical with the rest of the endometrium. They are formed by the neoplasm being forced by expulsory efforts towards the uterine cavity. The breadth of the base of the tumor varies; the very broad based growths, called by some submucous and by others intraparietal, usually belong to the mixed class, but for clinical reasons I class them as submucous tumors, and do not consider mixed tumors under a separate heading. They may become pedunculated, forming the fibroid polypus. The pedicle also varies in different cases. These polypoid growths are sometimes entirely devoid of a mucous membrane investment, and are then also without a muscular capsule, the pedicle consisting principally of connective tissue. The mucous membrane covering the large broad-based tumors is usually hypertrophied, but in some cases it is atrophied. The surrounding endometrium, sharing in the changes of circulation in the mucosa covering the tumor, also undergoes inflammatory changes. Sometimes the mucosa covering the growth, as the result of traumatism, will undergo more or less ulceration. As a rule, the submucous tumors contain less fibrous connective tissue and hence are softer than the other types. In the beginning the fibro-myomatous polypi are globular, but their contour sometimes changes to the shape of a pear, in conformity to the shape of the uterus, and sometimes they assume an hour-glass shape; this latter is due to a greater or less degree of imprisonment of a part of the growth by the internal or external os. It occasionally occurs that a submucous growth which has become pedunculated is entirely expelled and the pedicle detached, usually by the weight of the polypus. This may also take place with broad-based tumors, though more rarely. Cystic degeneration seldom occurs in this variety of tumor.

FIG. 7.

Myo-fibromatous polypus, one-half natural size.— C, cut surface.

In this form of growths there is sometimes a formation of spaces, vascular lacunæ, due to a dilatation of blood-vessels, forming what has been described as myoma telangiectodes and myoma cavernosum, a condition not to be confounded with angioma cavernosum.

Interstitial fibro-myoma is the designation which we apply to tumors developed within the uterine wall and forming a part of it. Their natural tendency is to change into one of the previous varieties, even becoming

pedunculated by uterine contractions.   The uterine structure is nearly
always hypertrophied, but there are cases in which the opposite condition is
present.   The mucous membrane of the uterus is almost invariably in a
state of inflammation.   The nearer the tumor is situated to the mucosa the
more apt are we to find interstitial endometritis, and when farther away the
glandular form predominates; but, just as occurs in chronic metritis, the
same specimen may show various forms of inflammation.   The ovaries are
frequently the seat of inflammation, and occasionally also the Fallopian
tubes.   Of the gross lesions, I have most frequently found a suppurative
condition of the tubes; hæmatosalpinx and hydrosalpinx less frequently.
The adnexa may be displaced in various directions.   Ordinarily the tumors
are multiple, or a conglomeration of them is enclosed in the capsule which
surrounds growths in this situation, and which is composed of muscular

FIG. 8.

Interstitial fibro-myoma with an (*I*) intra-ligamentous fibro-myoma.

structure and loose connective tissue, so that when we cut through a uterus
thus degenerated the neoplasm will protrude beyond the cut surface, ren-
dering enucleation usually quite easy.   In the so-called soft fibro-myomata,
the connection with the bed of the tumor is generally quite intimate, and
at the surface of adhesion the growth is nourished by blood-vessels of
various sizes, whence the more rapid growth of this form.
    The cavity of the uterus is invariably elongated, and at times is so
tortuous, owing to the presence of several tumors in the organ, that a sound
cannot be introduced into it.   It is possible for a growth developed in
the lower segment of the uterus to undergo a process of evolution into
the cervix, as in Duchemin's case at the Strasburg clinic.   The position
of the uterus in the pelvis varies with the situation of the growth.   It is
generally displaced anteriorly, or posteriorly, or laterally; less often we
find it elevated or low down in the pelvis.   When the growth develops
somewhat laterally in the lower segment of the posterior surface, with a

subperitoneal evolution, the pelvic contents are often seriously interfered with and the uterus becomes displaced very markedly by the intra-ligamentous growth : usually the posterior fold of the broad ligament is first bulged out.   There may be a complication of both varieties in one case. From the pressure of large tumors, the abdominal muscles sometimes become thinned, and complete separation of the recti may take place, the fibromyomatous uterus protruding so that its covering consists of peritoneum and skin only.

FIG. 9.
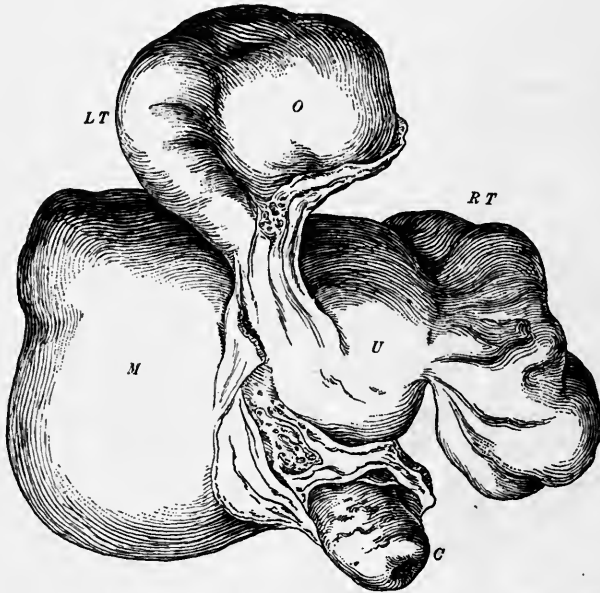
Subperitoneal fibro-myoma, with double suppurative salpingo-oöphoritis, posterior view.— *U*, uterus; *C*, cervical portion; *RT*, right tube; *LT*, left tube; *O*, left ovary ; *M*, fibro-myoma.

Fibro-myomata of the cervix are much more rare.   Anatomically they are to be divided similarly to those of the body.   Clinically they should be subdivided into those of the supra- and those of the infra-vaginal portion of the cervix.   The subperitoneal tumors of the supra-vaginal portion are of the utmost importance on account of the urgent symptoms produced after they have attained sufficient size to fill the true pelvis, and also because of the difficulty of effectual treatment.   They generally develop either into the folds of the broad ligament or between the layers of the pelvic floor.   It is not rare to have renal lesions produced consequent to the neoplasm, but this is also the case in other varieties of pelvic tumors.   The same may be said of the production of myocarditis, when the patients have suffered much from metrorrhagia.   Pedunculated submucous fibro-myomata of the cervix sometimes protrude from the vulva : they then may be mistaken for procidentia of the uterus, which condition can be caused by them. They are also sometimes completely separated from their base : this may happen especially when the neoplasm has attained some weight and the

pedicle is thin. The tumors developed in the infra-vaginal portion fill the vagina to a varying extent.

Minute Anatomy of Fibro-Myomata.—Tumors of great consistency exhibit under the microscope smooth muscle-fibres in excess of fibrous connective tissue. The smooth muscle-fibres are invariably arranged in bundles holding a number of spindles varying from four to a dozen, and are ensheathed by a delicate amount of connective tissue both around the bundles and around the individual fibres. It is almost im-

<div align="center">FIG. 10.</div>
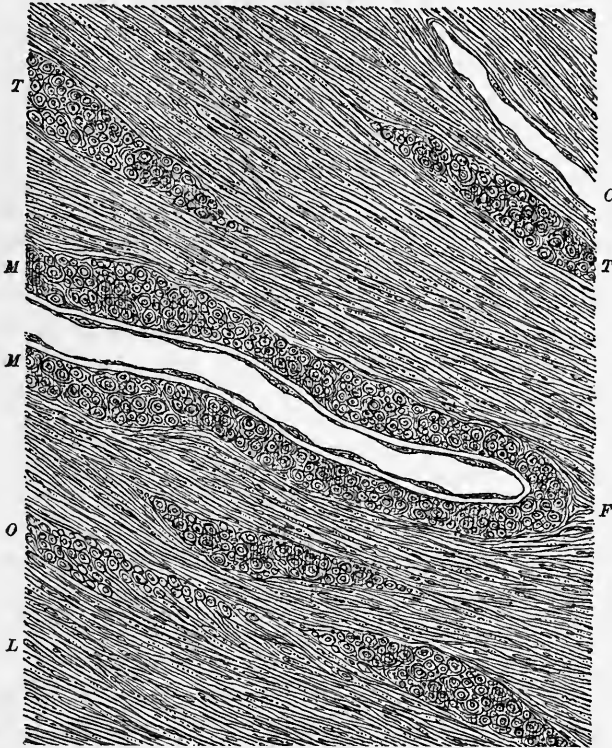
Fibro-myoma of uterus, × 500.—L, longitudinal section of smooth muscle-fibres; T, T, transverse sections of smooth muscle-fibres; O, oblique section of smooth muscle-fibres; F, fibrous connective tissue; M, M, muscle coat of artery, much thickened; C, capillary blood-vessel.

possible, in longitudinal sections of bundles, to distinguish between muscle and connective-tissue structure. This, however, is easy where the muscle-bundles are cut transversely. True fibro-myomata are composed of freely interlacing bundles of smooth muscles; their vascular supply is surprisingly scanty, and it is only in the broader track of connective tissue that we are able to trace scanty capillaries. Arteries, when met with, invariably show pronounced hyperplasia of the middle or muscular coat. Sometimes we meet with arteries in a state of waxy degeneration involving mainly the middle coat. Not infrequently we observe obliterated arteries still recognizable from the presence of the middle coat; and it is this

feature which arouses the suspicion that the main source of growth of fibro-myoma is to be sought in endarteritis obliterans. Further researches are required in order to settle this important question.

Tumors of this type containing an excess of connective over muscle tissue are termed myo-fibroma, one of which is represented in Fig. 7. Here we notice a distinct amount of connective tissue both around the bundles and around the individual muscle-fibres. Again, the consistency of such tumors depends upon the nature of the connective tissue: if this is strictly fibrous, it renders the tumors hard; if, on the contrary, it is myxo-fibrous or myxomatous, the consistency is more or less soft. Lack of muscle-fibres will settle the diagnosis of fibroma or myxoma.

Degeneration and Alteration.—During sexual activity the growths usually undergo changes dependent upon physiological processes: thus, at the time of menstruation and during pregnancy a marked increase in size is sometimes noticed; this is especially true of tumors approaching the myxomatous type. Kiwisch has reported some as increasing to nearly double their volume in a few hours. The enlargement is due principally to changes in the circulation causing œdema of the growth. In the case of a patient with a large, soft, interstitial fibro-myoma, who consulted me for the first time during the menstrual flow, when electricity had just come into vogue, the tumor was so markedly diminished at the time of her next call that I anticipated complete disappearance of the growth from a continuance of the treatment. Within a month, however, I was undeceived by seeing it increase to its former size. In another case I have seen complete disappearance of the tumor within a few months after parturition. Œdema is frequently the forerunner of gangrene of the tumor. As in other parts of the body, so here, gangrene can take place only from circulatory changes, which may have various etiological factors. Among the most frequent causes in submucous tumors is undoubtedly traumatism of the mucosa covering the growth during treatment, or examination with the sound, which first produces ulceration at the injured point. Pedunculated submucous tumors already partially expelled by nature undergo gangrene by constriction of the neck of the protruding part of the tumor. Electrical treatment undoubtedly gives rise occasionally to such disastrous results. Castration for the relief of symptoms caused by large soft tumors may have the same effect.

The majority of fibro-myomata undergo progressive induration at and after the menopause, when the tumor will diminish in volume. It is for this reason that calcified tumors are found so frequently in old women. Calcification is a very rare change: I have myself observed only one instance of it. Even calcified tumors are not exempt from the possibility of suppuration, which generally occurs in the myomatous tissue. The rule is that when the growth has become calcified it is practically innocuous. The process of calcification consists of an infiltration of the constituent elements with lime salts. The tumors were formerly described as osseous: this was

undoubtedly an error, as is apparent under the microscope after treatment with solutions of chromic acid. Sometimes such tumors are expelled by the same process as pedunculated submucous growths. Such expelled neoplasms were called "uterine stones."

With regard to *fatty degeneration* causing diminution of the growth, I have serious doubts: pure fatty degeneration is certainly of very rare occurrence.

Myxomatous degeneration is said to have taken place when the interstitial tissue is infiltrated with a gelatinous or a mucous fluid.

Suppuration has purposely been omitted here, because the process generally so termed is really gangrene, although there are cases on record in which pus was present in the centre of the tumor. Mann's case of suppuration after parturition was of the fibro-cystic variety, and was preceded by fatty degeneration, as in Martin's case.

Cystic Degeneration.—In fibro-myoma we sometimes meet with a peculiar process of liquefaction invading both the muscle and the connective tissue. This process is allied to œdema, and finally leads to a disappearance of the constituent elements, which are replaced by serous liquid. Pathologists designate this process, though erroneously, cystic degeneration of the fibro-myoma. The designation hydro-myoma would be preferable, since the cavities filled with sero-albuminous liquid are never found lined with epithelium, which is the distinguishing characteristic of true cysts. A good illustration of such liquefaction of a fibro-myoma is shown in Schroeder's case. (Fig. 5.)

Primary *carcinomatous degeneration* of fibro-myxomatous tumors is of doubtful occurrence; no authenticated case has yet been shown; but the occurrence of cancer in connection with the neoplasm in question is not unusual, especially cancer of the portio vaginalis. The condition which has on several occasions been reported as carcinomatous degeneration of a fibro-myoma was apparently sarcomatous degeneration, the latter being somewhat common. Yet Schroeder cites a case in which, he asserts, the adenomatous mucosa, sending offshoots into the interior of the tumor, changed into adenoid cancer.

Etiology.—Although much attention has been paid to the causation of these neoplasms, we must admit that nothing is known; not a single cause of the very many assigned has been proved with reasonable certainty. Winckel's careful study and that of others led, in my opinion, to no result. We usually see it noted that sterility is an etiological factor, but the correct statement would be that fibro-myomata are conducive to sterility. The theory that the tumors do not exist prior to puberty is disproved by the interesting case quoted by Sutton of a patient who had never menstruated or shown any evidence of ovulation, and yet had a large fibro-myoma of the uterus. I am convinced that they sometimes exist before puberty, but do not then produce any symptoms; and their usually exceeding slow growth will account for the late presentation of the patients,—viz., at the time of

greatest sexual activity. Our observation has only established that, in addition to age, race is an important factor: why it should be we cannot say; but it has been satisfactorily demonstrated that, whereas ovarian tumors and cancer of the uterus are rare in the negress, fibro-myomata are very common.

Symptoms and Course.—There is no disease or condition which is so simple histologically and yet presents such manifold symptoms as fibro-myoma of the uterus. In order to appreciate this, the seat of the neoplasm of a typical case must be considered, and to some extent its histological construction. Frequently small subserous tumors exist without causing any symptoms. Hemorrhage, either menorrhagia or metrorrhagia, is common to nearly all the fibro-myomata; least frequent in the case of the subserous and most frequent in the submucous variety. In pedunculated subserous tumors it is usually entirely absent; but if by their situation the circulation in the uterus is interfered with, causing changes in the uterine mucosa, this symptom manifests itself. In the beginning the bleeding shows itself by prolonged and more profuse menstruation, but with submucous growths the loss of blood is occasionally atypical from the beginning. The blood escapes from the tumor itself only under exceptional circumstances, as in a case reported by Duncan, in which death occurred from the rupture of a large uterine sinus. The ordinary cause of bleeding is endometritis and stasis from mechanical causes. More or less profuse leucorrhœa of variable character is also present in the majority of patients.

A symptom of equal importance with that of bleeding—often, indeed, of greater importance—is pain, at times of an intermittent character, most intense during menstruation, consisting of backache, bearing-down pain, and sensations similar to uterine colic : these are characteristic of interstitial and submucous tumors. Growths filling the pelvis cause the most excruciating sciatica at times, also painful and difficult defecation, hemorrhoids, and vesical disturbance ; but even very small tumors on the lower and anterior surface of the uterus will cause dysuria. Suppression of urine can be produced by direct pressure on the ureters, with subsequent serious renal changes, as pyelo-nephritis. Large subserous tumors sometimes cause local peritonitis from irritation, especially about the menstrual period, when the growths often increase in size temporarily from engorgement of the vessels ; the patients may have marked pain from pressure on the serosa covering the tumor. In exceptional cases, peritoneal adhesions form with the adjacent structures. It is not unusual to meet with myocarditis if the tumor had given rise to irregular profuse hemorrhages : therefore a badly-acting heart is, contrary to the generally accepted view, an indication for early operation. Displacements of the uterus depend on the position of the growth. A tumor anterior to the uterus will cause it to be displaced posteriorly, as will also one in the posterior wall, or a pedunculated growth of the fundus sinking behind the uterus ; later, however, the womb is pushed

anteriorly and upward. Intra-ligamentous growths usually push the organ to a greater or less degree towards the opposite side. The uterus may also be dragged high up or pushed low down by fibro-myomata at the fundus.

Pedunculated subserous tumors falling behind the uterus in Douglas's cul-de-sac may, by inflammation of the serosa covering them, become firmly adherent, producing all the symptoms of incarcerated pelvic growths. Œdema of the lower extremities can thus be caused. Ascites also makes its appearance occasionally, as the result of the irritation produced by the subserous growths. Pedunculated submucous fibro-myomata may lead to complete inversion and procidentia of the uterus and vagina, and the bleeding caused by them, as long as they are intra-uterine, is occasionally alarming. This variety is exceedingly prone to undergo gangrene, when, in addition to pain and bleeding, sepsis of varying intensity and offensive discharge will be present. Interstitial myomata sometimes produce symptoms resembling those caused by subserous tumors; at other times the manifestations are like those of submucous growths. The more nearly the tumor approaches the uterine mucosa the more likely will be the presence of one of the forms of endometritis, which will cause bleeding and leucorrhœa.

To recapitulate, fibro-myomata cause as predominating symptoms menorrhagia or metrorrhagia, leucorrhœa, backache, abdominal pain of varying character; if intra-pelvic, bladder and bowel disorders, pain in the thighs, sometimes pain in the knees. Menstruation in patients with cervical, interstitial, and submucous tumors is usually painful. There may be numerous other symptoms in addition, such as cardiac palpitation, indigestion, headache, insomnia, etc., but the latter are inconstant, and, as stated previously, the first-named symptoms depend on the seat of the neoplasm.

The hydro-myomata (incorrectly termed cysto-fibromata) are in the greater number of cases subserous, and sometimes attain a large size: I have myself removed one weighing thirty-two pounds. They are generally of rapid growth, and are characterized by containing a variable amount of fluid between their interstices, which usually coagulates on exposure to the atmosphere, or is in cavities formed within the tumor by the intervening solid stroma between such interstices having broken down : hence they resemble ovarian cystomata to such a degree that in the majority of instances they have been mistaken for them, the error not becoming apparent until the time of the operation. It is obvious that the ordinary fibro-myoma becomes œdematous, and then the cystic changes follow. The usual course is for the growths to decrease in size after the menopause, and in some instances to disappear entirely ; in other instances they undergo calcareous degeneration, as previously stated, but this is not always the case ; on the contrary, it may be that they begin to increase at this time. Subserous growths, if pedunculated, occasionally become entirely separated from the uterus, and if they are adherent to other parts their nourishment takes place through the adhesions ; if no adhesions are present, they may remain in the peritoneal cavity without producing symptoms.

The submucous fibro-myomata not infrequently become pedunculated and are entirely expelled, but when partially extruded from the uterus that portion which is exterior to the os externum is liable to become gangrenous if the circulation is much impeded by the contracture of the cervix around the tumor. Enucleation may also take place in interstitial tumors by the mucosa covering the growth being in some way partially destroyed or injured. Again, either in submucous or in interstitial tumors the entire bed of the growth may become inflamed or suppurate, the tumor subsequently undergoing similar changes or becoming gangrenous. When gangrene and suppuration have ensued in the tumor, death, if this is the termination, is as often due to peritonitis as to pyæmia or septicæmia. It may, however, be possible for softening to take place in submucous tumors without any discernible cause, the whole tumor being expelled piecemeal without the production of any symptoms indicative of gangrene. Careful examination of such expelled particles shows them to be softened masses of the tumor in fatty disintegration. Should pregnancy occur, the tumors usually grow more rapidly, but after parturition they may completely disappear. I have also seen one instance of complete disappearance of an interstitial fibro-myoma larger than an infant's head, without the influence of the menopause or parturition. Pregnancy is not frequent: it is least of all liable to occur in connection with submucous tumors.

Diagnosis.—The symptomatology should always be considered in connection with the result of the physical exploration, which will be an aid, especially in complicated cases. The bladder and rectum should be emptied prior to examination. Ordinarily it is not difficult to determine the existence of a tumor if careful bimanual examination is made; but a marked difference will be found in most cases, according as such an examination is made during menstruation or in the interval, because at the former time the neoplasm has a greater blood-supply, and consequently is more succulent, especially if it abounds in connective tissue, when its size is more or less increased.

A small subserous tumor, if pedunculated, may be mistaken for an ovary. The former is usually firmer to the touch than is the ovary, has a smoother surface, and is not sensitive on bimanual compression. When the tumors attain the size of a uterus, especially if they have a broader base, they may be mistaken for that organ—if posteriorly situated, for retroflexion; but the difference to touch between uterine structure and fibromyomatous tumor is usually sufficiently well marked, the consistency of the neoplasm being harder; by carefully tracing the direction of the cervix, one can generally determine the position of the uterus. With the aid of the probe or sound we can with certainty make out the direction of the uterine canal, if the other points are insufficient. Careful antisepsis is required if a sound is used. The larger the tumor and the broader its base, the more difficult is it to determine whether it belongs to the uterus or is only in close connection with the organ. If it is a solid tumor of the

ovary, the uterine cavity will not be found elongated and there are not likely to be any menstrual disturbances; moving a solid ovarian tumor which is not adherent to the uterus will have no effect on the mobility of the womb; but any ovarian tumor with very tense and thick walls closely adherent to the uterus is practically impossible to distinguish unless fluctuation can be elicited. Exploratory puncture can be resorted to, but I shall not consider it as a means for differential diagnosis, on account of its danger, preferring to make an exploratory incision, which can, if necessary, be immediately followed by the proper operation.

Large interstitial fibro-myomata coexisting with ovarian tumors can be diagnosed by the recognition of two tumors, one uterine, the other independent of the first and giving evidence of fluctuation.

Interstitial tumors invariably cause elongation of the uterine cavity, a sound often entering its whole length; but if several interstitial growths are present, the canal may be so tortuous that a sound, or even a probe, cannot be introduced at all. From pregnancy the diagnosis is rarely difficult: the history and physical examination are usually sufficient. There may be cases of pregnancy with considerable bleeding, caused by threatened abortion: in such cases the direct exploration of the uterine cavity is necessary. When the tumor is complicated with pregnancy, greater difficulties arise, and the diagnosis will depend upon our ability to distinguish the tumor by its hardness and the degree of its protuberance from the uterus. There are, however, exceptional cases of fibro-myomata in which it is practically impossible to determine the coexistence of pregnancy in its early stages. Small interstitial growths are often exceedingly difficult to diagnose; they may give rise to the belief that the patient has a chronic metritis. On palpation, we can often distinguish the hard fibro-myomatous nodules in the wall of the uterus, which is softer to the touch: thus, if we feel a circumscribed induration somewhat protuberant on the surface of the uterus, we are justified in diagnosing a small interstitial fibro-myoma. Very small growths cannot be diagnosed with any degree of certainty. Small submucous tumors may resemble chronic metritis or endometritis, which also cause bleeding. The curette and direct exploration are the only means of deciding the question. When the submucous tumors are somewhat larger they resemble in some degree early pregnancy with threatened abortion, but the uterus containing them is harder and more globular.

The nearer the tumor approaches the cervix the shorter the vaginal portion will become. In addition, we have the direct examination of the interior of the uterus to aid us.

A partially extruded growth of this character may be mistaken for cancer of the portio vaginalis, especially when the former is gangrenous; in both conditions there is an offensive and profuse vaginal discharge and a somewhat similar sensation on palpation, but with care we shall be able to demonstrate the cervix surrounding the protruding mass: besides, a fibroid does not give rise to bleeding, as is the case with cancer which is breaking down.

Fibro-myomata of the pelvic variety may resemble pelvic exudations. If the tumors are not adherent, they can be displaced by the examining fingers, do not encroach so closely upon the pelvic wall, and are generally harder to the touch; but if the tumors are adherent and are surrounded by old exudation, it is occasionally impossible to distinguish between them. In such cases time must be the diagnostician; the exudate becomes smaller and often disappears entirely. Acute exudations should not cause much hesitation in diagnosis, because they are always accompanied by more or less febrile reaction, the onset is sudden, with acute pain and fluctuation, or elasticity is more or less distinct.

Intra-ligamentous fibroids are distinguished by their close connection with the uterus and their unyielding feel to the touch. Such growths developing from the supra-vaginal portion of the cervix frequently cause the vaginal portion to become retracted and to form practically a portion of the tumor, which we feel low down, hard, and nodular.

The symptoms of compression are extremely marked in this variety. Growths in the vaginal portion of the cervix are usually readily recognized by the protuberance in the lip affected, whereas the other lip is thinned out and hugs the part affected, the cervical opening resembling a laceration of the cervix. Intra-uterine polypi yield symptoms analogous to those of fungous endometritis or some of the malignant diseases of the corpus. Curetting and microscopical examination of the scrapings will determine the condition.

In the telangiectatic or cavernous tumors the very great increase in size and greater tensity at menstruation are important, and auscultation elicits a peculiar bruit, although the latter is found in ovarian tumors and also in soft myomata, as well as in pregnancy. It is often impossible to distinguish them from ovarian cystomata; but, in addition to the points mentioned, it is necessary to establish the relation between the uterus and the tumor.

The prognosis for the great majority of fibro-myomata is good so far as life is concerned, provided that the growth does not undergo one of the more serious degenerations, as malignant, gangrenous, cystic, etc. The cavernous variety may lead to a rapidly fatal issue by the rupture of a blood-sinus. The submucous and some interstitial tumors may eventually cause fatal anæmia.

Treatment.—This may be divided into palliative and radical, or surgical and medical. Our aim should be to free the patient of existing pain and to remove any condition which jeopardizes life. A serious operation should never be undertaken just because the woman has a fibro-myomatous tumor; the growth must in some manner menace life or health and not be amenable to other treatment before this is permissible. All medicinal treatment is absolutely useless in pedunculated subserous tumors. The hypodermic use of ergot, sometimes called the Hildebrandt treatment, has in some instances caused a cessation of growth in interstitial tumors, and even their extrusion, the latter especially in submucous growths; so we must conclude

that the treatment is applicable only to interstitial and submucous tumors; the action of the ergot is to cause compression of the blood-vessels by producing more or less marked contraction of the muscle structure of the tumor. The drug should be used in the form of solution of ergotin, twelve centigrammes (two grains) being injected twice daily into a fleshy part, the thighs, the buttocks, or in some cases the abdominal parietes. The solution should be prepared fresh every few days, and the part where the injection is made must be thoroughly washed with soap and water and then with alcohol and finally with some bichloride of mercury solution (1 to 1000); the needle should also be passed through the flame of an alcohol lamp just prior to use. After the injection the part must be massaged for a few minutes, to insure rapid distribution. The addition of chloral hydrate to keep the ergotin solution has been abandoned by me on account of the burning sensation which the drug causes. A preparation called "ergotole," manufactured by an American firm, may be advantageously substituted for ergotin. The patient can be taught to make the injections herself, because it would be too expensive for ordinary patients to come to their physician every time for an injection, inasmuch as these must be continued for a long period. It may require two hundred injections before any marked benefit is noticed, and in all probably from one to two thousand will be needed. Abscesses are avoided only by strict attention to asepsis. The other remedy which may be used with benefit in similar cases is the fluid extract of gold seal (hydrastis Canadensis) in half-teaspoonful doses three times daily; in case of gastric disturbance the dose must be diminished. A number of favorable results have been reported as regards the hemorrhage, and a few instances of decrease in the size of the tumor. Among the other remedies employed are potassium bromide and iodide, arsenic, phosphorus, chloride of calcium, mercurials, etc.; none of these, however, possess any positive therapeutic value. Various mineral baths and mud baths are of more or less benefit.

Among recent remedies, galvanism plays the most important *rôle*, whether justly or not remains to be seen. Though formerly a strong advocate of this treatment, I have been forced by repeated failures to discard it. In only one variety of tumor does its application offer a prospect of the alleviation of symptoms,—viz., the intra-mural; in this class of cases it certainly does relieve many patients. Apostoli has brought this therapeutic measure into repute and has found many ardent advocates to follow him.

The method introduced by Cutter—puncturing the tumor through the abdominal walls with needles—has been almost universally discarded, so that I shall briefly describe Apostoli's method only. The implements necessary are: a galvanic battery with enough cells to generate a sufficiently strong current, a forty-cell battery being ordinarily required, or in cities having the Edison current the latter may be utilized, with the aid of an adapter and a proper rheostat to give sufficient resistance; a large clay electrode,

several intra-uterine electrodes, and an electrode for electro-puncture (see Fig. 11); a rheostat and a galvanometer to measure the intensity of current used.

FIG. 11.
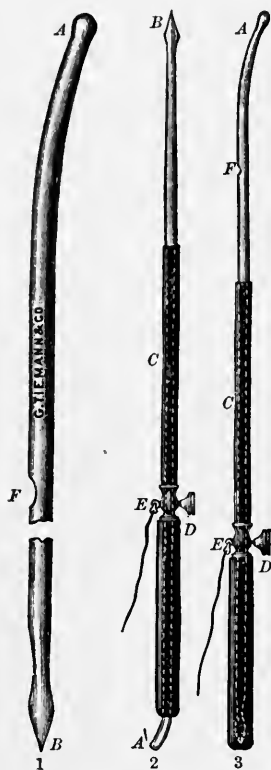
Apostoli's uterine electrodes.—1, natural size; *A*, ordinary hysterometer; *B*, trocar for puncture; *F*, notch marking average depth of uterus; 2 and 3, entire instrument reduced to one-third size; *C*, celluloid handle to protect the vagina; *E*, electrode; *D*, thumb-screw to regulate the length of the exposed sound.

The treatment by electricity is to a certain degree a surgical procedure : hence the utmost cleanliness is required. The vagina and vulva must be carefully cleansed with soap and water and douched with solution of bichloride of mercury; the intra-uterine electrode is sterilized in an alcohol flame and is kept in a carbolized solution. The hands of the operator are likewise scrubbed and disinfected after the application of the abdominal electrode, which must be large enough to cover the abdomen. The skin upon which the clay electrode is to be applied must be inspected, and any existing excoriations covered with a thin coating of collodion to prevent acute pain at such points. In place of clay electrodes, others have been proposed and used. The kind of electrode is immaterial, so long as it adapts itself evenly to the skin and covers a large area. The electrode is introduced into the uterus by means of touch alone, the patient being on her back; if it is intended to check hemorrhage, the anode or positive-pole is used within the cavity ; otherwise we employ the cathode.

The current is turned on very slowly, so as not to give any shock. The strength of the current must necessarily vary with different individuals. I have never been able to use more than one hundred milliampères, often not more than fifty, the patients complaining of intense pain when higher intensity is resorted to. Under an anæsthetic, I have used the strength advocated by Apostoli,—namely, two hundred and fifty to three hundred milliampères. If the anode is applied within the uterus, it must be of platinum or carbon ; steel or copper will corrode. The active part of the electrode is insulated with a rubber cover over that portion which does not enter the uterine cavity. In cases where an intra-uterine electrode cannot be introduced, owing to the tortuous condition of the cavity, and where the tumor is accessible to the trocar-pointed electrode, which must always be made the negative pole, this is pushed directly into the growth from one-fourth to one-half inch, the precaution being used to have the non-active part of the electrode insulated. Care must be taken to turn

the current on and off very gradually, so as to avoid the production of shocks; and the operator must always wait for any uneasiness or pain produced by the introduction of the electrode to subside. The action of the current should be continued from five to ten minutes. After the electrode is removed, a vaginal douche of some antiseptic solution must again be used.

The existence of suppurative salpingitis contra-indicates electrical treatment, death having occurred several times from an aggravation of the inflammation, with spontaneous rupture of the pyosalpinx, causing fatal septic peritonitis. Benefit should not be expected at once from this treatment, but it must be continued for several months, unless conditions arise which contra-indicate it,—namely, if instead of improvement the contrary takes place. It is a question as to what the mode of action is: however, that the positive pole possesses more than the cauterizing effect claimed for it by many seems certain to me. It is uncertain what the so-called "interpolar action" is.

Fig. 12.

Subperitoneal tumors filling the pelvis and causing agonizing distress can at times be dislodged, by placing the patient in the genu-pectoral position and pushing them above the promontory of the sacrum by pressure from the vagina or rectum. A Sims speculum should also be employed, to obtain the advantage of the air-pressure.

In case of hemorrhage, curetting, with subsequent local applications of tincture of iodine or pure carbolic acid, is often sufficient to afford relief for a long time. The patient, having been prepared with due care, is anæsthetized, and placed in the lithotomy position; the hypertrophied endometrium, upon the presence of which the bleeding is usually dependent, is removed with a Recamier's or a sharp curette; a dull instrument is useless. After the scraping an application is made to the interior by means of a Braun's syringe. The patient should be kept in bed for three or four days subsequently.

This treatment is applicable only to interstitial and to subperitoneal tumors with a broad base. I regard it as especially advantageous for anæmic patients, and repeat it

Platinum electrode.

in a few weeks, so as to gain time to build up the constitution for a possible radical operation. There are dangers connected with this treatment; for instance, in a tumor of medium size just beneath the mucosa the capsule may be injured and the bed of the tumor may become inflamed, with suppuration and gangrene as the result. A. Martin, however, purposely splits the endometrium covering the tumor, so as to permit the inflamed mucosa and blood-vessels to retract, which frequently causes a cessation of the bleeding.

Dilatation of the cervix occasionally affords benefit in this class of cases, relieving both the bleeding and the dysmenorrhœa, when the latter is due to narrowness of the cervical canal and the tumors are not large.

Ligation of the uterine arteries through the vagina has undoubtedly a very beneficial effect on many tumors, the pedunculated subperitoneal excepted. The operation is new. To Dorsett, of St. Louis, belongs the credit of proposing this treatment, although the scientific work of Sigmund Gottschalk in this direction should not be underestimated. Küstner did the operation in September, 1892, with good result. The stress laid upon the cutting off of the nerve-supply to produce additional change, as proposed by F. H. Martin, seems unnecessary. The main feature is the blood-supply. The operative technique employed by me begins with the disinfection of the patient; she is then placed in the position for vaginal hysterectomy; next the cul-de-sac of Douglas is opened, so that the needle can be guided by a finger introduced through the opening. A large full-curved needle armed with heavy catgut is now passed around the base of the broad ligament, including the uterine artery, and the ligature is tied.

The treatment of large tumors by this method should not be undertaken, and in tumors drawing the uterus high up it is not practicable.

Morcellation is applicable to submucous tumors of moderate size, and is sometimes practised in interstitial growths by some operators: we advise

Fig. 13.

Museux forceps.

against the operation in this class. The cervix is first liberated at its lower segment by a circular incision and is then split bilaterally; the bleeding is checked by ligatures in preference to clamps. The fibro-myomatous uterus is drawn down as low as possible by Museux forceps placed in the anterior

Fig. 14.

Bullet forceps.

and the posterior lip of the cervix. The tumor is examined with the finger to determine its relations with the uterus, and then an incision is made

directly into the growth, which has been grasped by a strong volsella and drawn forcibly downward; a piece is thus cut out with scissors or knife. In this manner the process is continued until the entire growth is removed, the Museux forceps being replaced at times by dentated cyst-forceps or by the serrated forceps of Péan. Large pieces of the tumor may

FIG 15.
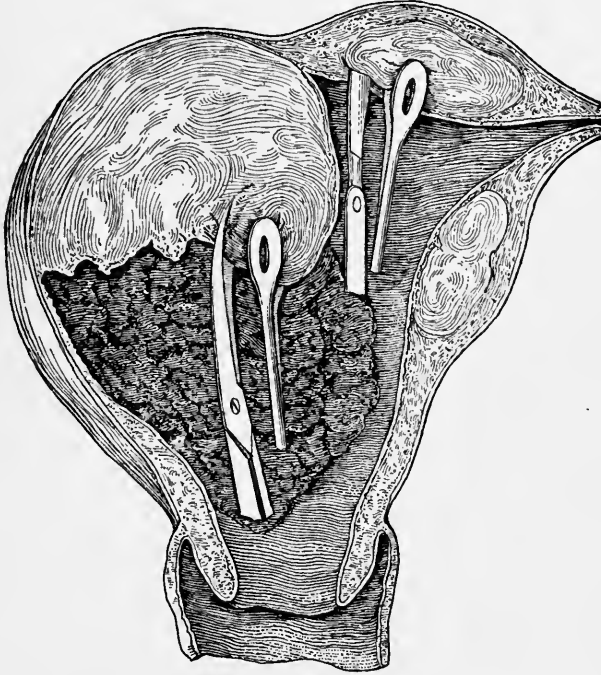
Removal of fibro-myomata by morcellation. (Péan.)

sometimes be enucleated by traction and rotation with the forceps. The last portions of the growth present a smooth, convex surface. Sometimes an additional growth is found, on examination, near the one enucleated; this is also removed. To all bleeding points hæmostatic forceps are applied, the entire operation being done under constant irrigation. After completion of the work, strips of iodoform gauze are packed between the forceps and an occlusion pad is placed on the vulva. The forceps are removed in twenty-four hours, and the gauze packing is taken out in two or three days, after which douches may be used, if necessary. The main danger in morcellation lies in septicæmia, pyæmia, peritonitis, and thrombosis or embolism.

Pedunculated submucous tumors and small interstitial growths should always be removed per vaginam where it is apparent that they can be enucleated from their bed when the cervix is dilated, especially such as are already partly expelled by the efforts of nature. If the fibro-myomatous uterus is small enough to be removed by vaginal hysterectomy, that opera-

tion may be done. It is, however, rare for small tumors to produce such serious symptoms as to require this mutilating operation. The method will be discussed under the section on vaginal hysterectomy for cancer.

Castration for Fibro-Myomata.—We have stated that at the menopause it is usual for many of these tumors to undergo retrograde changes, and that the symptoms formerly produced by them gradually disappear when menstruation has ceased. With this end in view, castration is frequently performed to bring on a sudden climacteric, and if the case has been properly selected the operation will in nearly every instance produce the effect desired. The error committed by operators is not in the operation, but in the choice of the case in which it is applied.

Large tumors, those which are soft or œdematous, pure submucous growths, subserous ones with broad bases, such tumors as produce agonizing pressure-symptoms by filling the pelvis, hydro-myomata or fibrocystic growths, and the telangiectatic variety, should not be treated by castration; not only because the result is frequently unsatisfactory, but also because the operation often leads to a dangerous condition: in submucous and soft tumors, gangrene and suppuration are occasionally produced. In cavernous tumors the danger of thrombosis is to be borne in mind. There is but one class of tumors in which I advise the operation,—namely, interstitial fibro-myomata of medium size which produce hemorrhage but no marked pressure-symptoms. Some operators, however, advise castration for nearly all varieties of these neoplasms, even for fibro-cystic growths. There are cases in which it is impossible to remove the ovaries *in toto*, owing to adhesions. I have myself met with a case in which my intention had been to remove the adnexa only, but owing to hæmatosalpinx and distorted adherent ovaries, not previously diagnosed, it was impossible to do less than a hysterectomy.

The operation should never be undertaken unless the surgeon is ready to do any other which may become necessary; although we may open the abdomen with the expectation of removing the adnexa, conditions may be found which make this impracticable; further, we should never attempt to remove the adnexa except by the median abdominal section, and the incision should be made at the level at which, from the size of the tumor, we expect to find them. The length of the cut is not of great importance, although it is preferable to make it as short as possible; usually from two to three inches will suffice, care being taken not to wound the surface of the tumor, on account of the bleeding which might follow such injury. The adnexa are tied off with catgut, and the abdominal wound is closed with superimposed buried sutures of catgut,—peritoneum, fascia, and skin each separately.

Myomectomy.—Whenever it is possible to remove a tumor from the uterus without destroying the organ, it should be done, thus leaving the woman with functionating pelvic organs. The operation is called myomectomy, and was introduced by A. Martin, of Berlin, although it had

previously been done by Spiegelberg and Spencer Wells. It is suitable for all subserous growths, and for such interstitial ones as can be enucleated without entering the uterine cavity, or by opening it to but a small extent.

After the abdominal incision has been made the fibro-myomatous uterus is brought outside of the abdominal cavity, and with a few provisional sutures as much of the wound is closed as is practicable. The uterus rests upon a sterilized towel; over the most prominent part of the tumor an incision is made and the growth or conglomeration of growths is enucleated. Sometimes the uterine cavity is opened in this procedure; hence it is well to curette and irrigate it with an antiseptic solution prior to the abdominal operation, because the mortality is far greater in cases in which the cavity is opened than in those in which this is avoided. The bed of the tumor is closed with successive tiers of catgut sutures. If the uterine cavity has been opened and previously disinfected, the danger is not aggravated, and the mucosa need not be closed separately. A rubber ligature around the cervix during enucleation should also be discarded, but care must be taken to stop all bleeding from the uterus before closing the abdominal walls. The ovaries should not be removed: in cases requiring removal of these glands, the indication is to do a hysterectomy.

Supra-vaginal hysterectomy with extra-peritoneal treatment of the pedicle is rapidly losing ground, yet under some circumstances it is advisable,—namely, when the patient is very anæmic, or when there is reason to believe (for we cannot always diagnose it with certainty) that there is a cardiac lesion or any condition which requires a rapid operation. After opening the abdomen by an incision as long as is necessary to allow of the dislodgement of the fibro-myomatous uterus, the adnexa are tied off at either side, and another ligature is placed on each side of the broad ligament, low down, so as subsequently to liberate the upper part of the cervix. A long clamp is placed on the uterine side, and the ligament cut between it and the ligature. Now a rubber ligature or a Koeberlé wire clamp is tightened around the cervix, care being taken that a fold of the bladder is not included, which danger is lessened by putting a sound into the viscus and letting an assistant outline the attachments, or by filling it partially with a mild solution of boric acid. The uterus with the tumor is amputated about half an inch above the constriction. Immediately above the ligature two long steel needles are passed crosswise through the cervix, the peritoneum being previously attached all around it below the constriction and closed through the entire wound, while the stump is held by an assistant with a volsella. The abdominal wound is closed in layers with continuous catgut sutures, or, if preferred, interrupted silkworm-gut sutures can be passed through the entire thickness of the abdominal parietes after the peritoneum has been attached to the stump: the latter method, however, though it saves time, is not so effective as the first in guarding against subsequent hernia. The pins rest upon the abdomen: to prevent their cutting into the skin, a small roll of gauze or rubber plaster is placed under them. The

stump is carefully dried, then dusted with some powder, aristol, subnitrate of bismuth, or iodoform, and covered with gauze. The wire clamp is tightened as necessity demands immediately after the operation, and subsequently a little more each day. After the lapse of from ten days to two weeks or more the pedicle drops off entirely from the constrictor. The important point in the operation is to constrict only the cervix, and not a part of the body of the uterus or a part of the tumor. The growth, if extending below the constriction, must be enucleated; then there will be a thin pedicle, just as Hegar, who was the first strong advocate of the extra-peritoneal treatment by this method, demands.

FIG. 16.
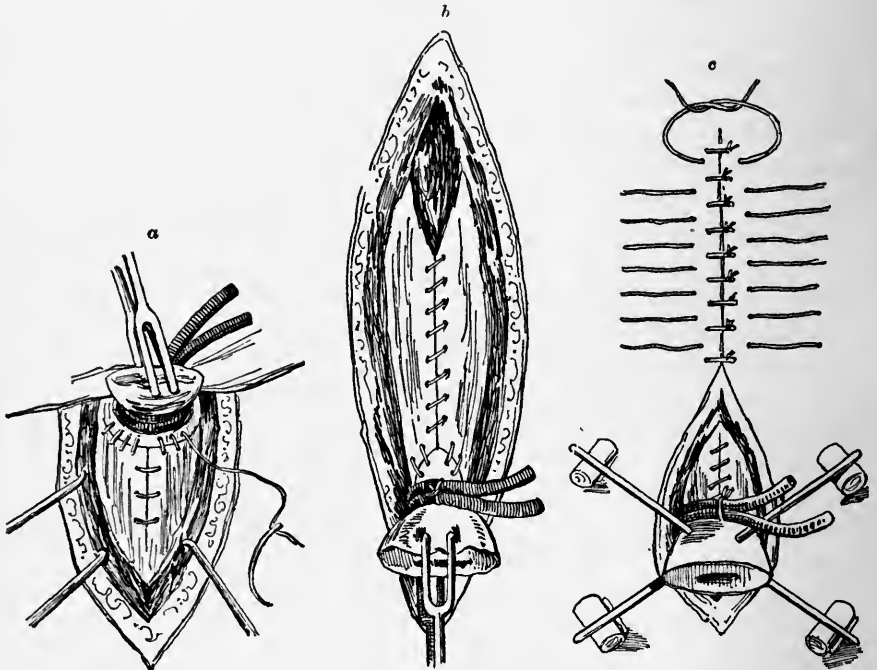
a. The suture of the peritoneum to the lower part of the pedicle is begun, the pedicle being drawn upward, so that its distance from the pubes is much increased.

b. Suture of abdominal walls above the pedicle, of the musculo-aponeurosis.

c. Peritoneum sutured in a ring about the lower part of the pedicle, the stump being depressed to show the suture. Deep sutures for integument in place, and superficial ones tied above the pedicle. The wound is shown with the cutaneous sutures below the pedicle not yet in place. (Pozzi.)

The advantages of this method are the rapidity with which the operation can be completed, if necessity requires, and the safety from hemorrhage. Its disadvantages are the protracted convalescence, the danger of hernia at the lower angle of the wound, and some risk of infection from the stump.

Intra-Peritoneal Treatment of the Pedicle.—The operation, in its first stages, is similar to that previously described; but after turning the tumor out and tying off the adnexa it differs, inasmuch as no elastic ligature or wire clamp is required around the cervix. The broad ligament should be tied low down, so as to secure the uterine artery. Anteriorly, a transverse

incision is made a little above the attachment of the bladder and a corresponding incision posteriorly; a cup-shaped cavity is cut out, which should include the upper part of the cervical canal. This cavity is now closed with continuous buried catgut sutures. A separate row is used to unite the peritoneum over the stump. No bleeding should be present after completing the work.

Another method of supra-vaginal hysterectomy is lauded very highly by Dr. Baer and others who have adopted it. I give the description in Baer's own words:

"After the required abdominal incision is made, all existing adhesions of omentum, intestines, etc., are separated in the usual way, and the tumor lifted out of the abdominal cavity. If the incision has been an unusually lengthy one, several sutures are then placed at its upper end for the better protection of the intestines. The patient may now be elevated to the Trendelenburg posture, if deemed best, and the parts thoroughly studied, so that a clear idea as to the character and location of the tumors and pedicle may be obtained before the ligation and separation are begun. The

FIG. 17.
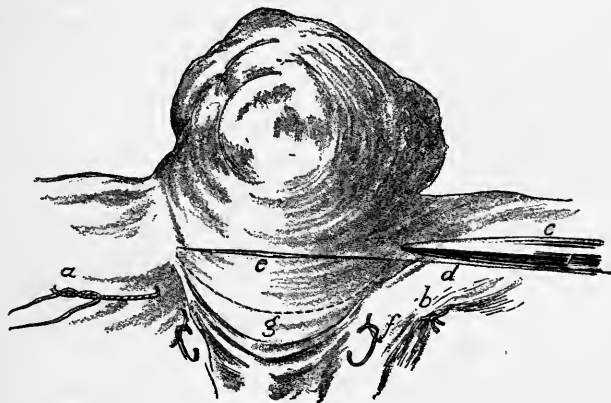
a, position of first ligature, transfixing broad ligament and including ovarian artery and veins; b, same tied; c, pedicle forceps grasping broad ligament under Fallopian tube and ovary to prevent reflux from uterus, when d, broad ligament, is severed just below forceps; e, incision of peritoneum above reflection of bladder, and peritoneum stripped down below g; f, ligature transfixing broad ligament at side of cervix, including uterine artery; g, dotted line, excision of tumor and amputation of cervix.

first step in the operation is the passing of a single silk ligature through the broad ligament near the cervix. This ligature is again made to transfix the broad ligament near the outer edge, to prevent slipping; it is then tied. A stout pedicle forceps is next placed under the Fallopian tube and ovary and made to grasp the broad ligament, for the purpose of preventing reflux from the uterus. The ligament is now severed just below the forceps, the incision being carried close to the tissues of the tumor. If deemed necessary, another ligature is now passed through the broad ligament farther down along the side of the cervix. This ligation and cutting are now repeated on the opposite side. The knife is then run lightly around the

tumor an inch or two above the peritoneal reflection of the bladder in front, probably a little lower behind, and the severed edge of the peritoneum stripped down with the handle of the scalpel, for the purpose of making peritoneal flaps. The next step is a most important one : it is the ligation of the uterine arteries. This is done in the broad ligaments, outside of, but close to, the cervix. Care must be taken to avoid the ureter on the one hand and the cervical tissue on the other. The ligature may either be placed within the folds of the severed ligaments or, which is preferable, made to encircle the double fold of the ligament and artery in one sweep ; action here will depend upon the size of the pedicle and the consequent separation of these folds. The constant traction which is made upon the pedicle by the assistant who is holding the tumor serves to draw out and elongate the cervix after the peritoneal covering has been incised, and thereby to permit deeper incision into the neck, which is next amputated with the knife by a wedge-shaped incision. The stump is now grasped with a small volsella forceps and further trimmed and reduced, if necessary, so that the entire supra-vaginal portion is removed before it is dropped back into the pelvis. The cervix being now released, it immediately recedes, and by the retractive and elastic properties of the vagina is drawn deeply into the pelvis, where it is buried out of sight by the peritoneal flaps covering it. These flaps have been rendered so taut by the ligatures which have

FIG. 18.

been placed that usually as the cervix recedes into the pelvis they close over it like elastic bands. The cervix is now in its natural position, and without a ligature or suture in its tissues. The operation is finished by infolding the edges of the peritoneal flaps, which may be secured by Lembert sutures, if necessary. I have not found this necessary if the ligatures which secured the uterine arteries had also grasped the severed folds of the broad ligaments, for this so tightens them that the sides are

a, centre line, infolded edges of broad ligament lying closely in contact, having been rendered taut by ligatures *f* and *b*, which have included both layers of the broad ligaments and the ovarian and uterine arteries and veins.

brought forcibly together when the cervix is drawn under. The bladder and surrounding tissues aid also in closing the pelvic cavity. Nothing whatever is done to the cervical canal. The portion of the broad ligament embraced in the first ligature is the same structure that forms the ordinary ovarian pedicle, minus the Fallopian tube. The other ligatures close the opened broad ligament, as a rule. If any other vessels are found spurting, they are, of course, ligated. I have not found it necessary to employ the temporary elastic ligature. The steps of the operation vary somewhat to suit the complications which may be present in the individual case, but the general direction and conclusion are practically the same in all cases."

Total Extirpation of the Fibro-Myomatous Uterus. *Technique of the Operation.*—The patient is prepared as for a vaginal hysterectomy, and then the operation is commenced from below, if the case is suitable for this, by ligating the broad ligaments as high up as possible, in the same manner as in vaginal hysterectomy for cancer, except that we do not ligate far away from the cervix. The vagina is likewise detached anteriorly and posteriorly from the cervix, and the bladder is dissected off as high as possible, the cul-de-sac of Douglas being opened first or last, whichever is the more convenient. No rule can be laid down : the operator must use his judgment as to which step should be taken first. The object to be attained is to free the lower segment of the cervix, when the operation from above is materially simplified : this becomes especially apparent in cases in which the pelvic floor is rigid. Now the vagina is packed with iodoform gauze, a strip of which protrudes into the peritoneal cavity by way of the posterior opening.

Next the abdominal section is made in the usual way, and the rest of the uterine attachments are tied off in sections and cut. To avoid injury of the bladder, the viscus, just prior to its detachment above, especially if it is spread over the tumor itself, should be partly distended with a weak boric acid solution to show its relation ; then about half an inch above its point of attachment to the uterus an incision is made and the remainder of the bladder is separated.

After excision of the fibro-myomatous uterus the vagina and floor of the pelvis are closed ; all that should be seen from above are the continuous catgut suture with which the pelvic peritoneum has been closed and a few small pedicles from the upper parts of the broad ligaments. The adnexa are tied off at the beginning, or as soon as practicable. The abdominal wound is then closed. In large tumors which do not crowd into the pelvis, but, on the contrary, pull the cervix and vagina towards the upper part of the pelvic cavity, so that the portio vaginalis can hardly be reached by the examining finger, this technique is out of the question, and the whole work must be done from above. But under these circumstances the operation from above offers no particular difficulty ; it is, in fact, decidedly easier than most operations for the removal of suppurating adnexa. The broad ligaments are secured in the same manner by successive ligation from above. The floor of the pelvis is closed in precisely the same way ; the only difference is, that the cul-de-sac of Douglas is opened from above, which, however, may also become expedient in the cases in which I advise the work to be done from below. Sometimes the opening cannot be readily made into the peritoneal cavity after the vaginal fornix has been opened ; we should then not endeavor to accomplish it, as the vagina has already been separated all around the cervix. The peritoneum is easily opened subsequently. It is obvious that in cases where the pelvic floor is rigid— especially in that class of tumors which crowd into the pelvis and produce pressure-symptoms or develop between the broad ligament folds—not only

time, but much tedious and difficult work, will be saved if the operation is commenced as I have described. The only requisite for operating in this way is practical familiarity with vaginal hysterectomy. I should not employ clamps, unless time were an important element in the case. If the tumor is of small size (not larger than a new-born infant's head), and is impacted in the true pelvis, or if it is intra-ligamentous, and if the portio vaginalis in consequence is pressed down so low in the vagina that it can be easily palpated, we have reason to believe that the pelvic floor is rigid. Then, if the vagina is sufficiently voluminous, the operation can be done with greater advantage as above described.

During convalescence the patients operated upon according to this technique will have a vaginal discharge more or less profuse and usually more or less offensive, owing to the sloughing off of the parametric stumps constricted by sutures in the vagina. In addition, then, to the vaginal douches, if such are used, it is well to apply an occlusion pad.

Pan-hysterectomy is applicable to all tumors; its advantages are that there is nothing left in the peritoneal cavity which can give rise to sepsis, provided that the technique of the operation has been carried out surgically, as we now understand this term. Convalescence is more rapid than in extra-peritoneal treatment of the stump, and the danger from hemorrhage is almost *nil*. I am an advocate of pan-hysterectomy if an abdominal hysterectomy is required.

Trendelenburg's Posture.—Pelvic elevation is familiarly known under the term Trendelenburg's posture, because it was first extensively used and advocated by Trendelenburg in his clinic in Bonn. In medical literature it became known through the writings of Dr. Willy Meyer, who at the time was assistant in the Bonn clinic.

The object of the posture is to afford a clear view of the pelvic contents, so that the surgeon can work aided by sight. The intestines gravitate towards the diaphragm, unless adherent in the pelvis, and every step of the operation is conducted with the aid of the eye. There cannot be a bleeding point in the pelvis without its being detected.

Its application is called for chiefly in operations in which the surgeon works in the pelvis. Dr. H. C. Coe states in an article in the *New York Polyclinic* that the position is likely to lead to secondary hemorrhage, owing to the sudden change brought about in the pelvic circulation when the patient is lowered to a horizontal position. I have as yet not met with such a complication, and it can, I believe, be prevented by the employment of a table which can be lowered very gradually.

The table depicted on the following pages (Figs. 19, 20, and 21) meets this requirement; besides being readily portable, it prevents contortion of the vessels of the neck during elevation.

It is, however, not necessary to have a table or frame expressly made, as the posture can be readily obtained in any household. An ordinary wooden chair has been frequently made use of by me, and is admirably

Fig. 21.

Table when in use, showing even plane between trunk, neck, and head.

adapted to the purpose. The two hind legs are cut off up to the cross-bar,
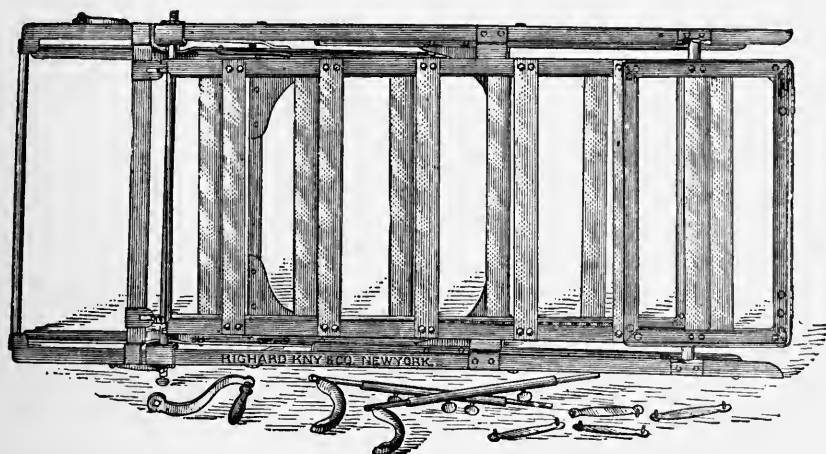
FIG. 19.

Table folded.

the chair is secured to the table, and the improvised structure is covered with blankets; or a sufficiently high box can be made use of; a board is fastened
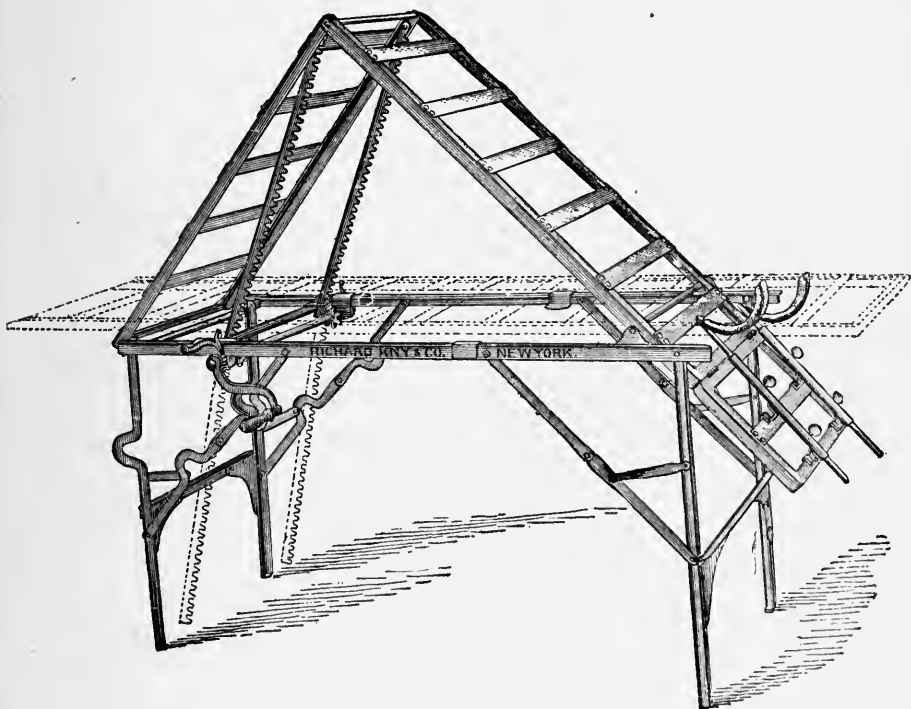
FIG. 20.

Table when elevated and when horizontal.

to it on the table, and all is covered. Such home-made contrivances have,

of course, great disadvantages, but still it is better to employ these than to do without the benefit obtained from the position when a difficult pelvic case is dealt with, such as a pan-hysterectomy. If we cannot see, there is more danger of injuring the bladder and ureters, and of insufficient security in the ligation of vessels, than when pelvic elevation is used. No complicated operation should be undertaken in the small pelvis without making use of the aid derived from this posture.

Intra-Ligamentous Tumors.—When growths of this character are large and broad-based, their removal is a formidable operation. The anterior surface near the upper border of the broad ligament is cut horizontally, and the growth is enucleated with the fingers and scalpel handle, an assistant making traction on the tumor with Museux forceps, and applying hæmostatic forceps wherever needed; the vessels are subsequently tied and bleeding surfaces are sewed over with continuous sutures; the whole bed of the growth should be closed in this manner. In supra-vaginal cervical tumors and those developed from the lower segment of the uterus there is always danger of coming in contact with the ureters: hence their situation must be constantly borne in mind. It is in the case of such tumors especially that pan-hysterectomy is advisable. Drainage is seldom necessary, but, if used, gauze drainage per vaginam is preferable.

Growths embedded in the infra-vaginal portion can usually be enucleated with ease. The most dependent part of the tumor is grasped with a volsella, and traction is made, so as to bring it as near as possible to the vulvar orifice. If the growth is not too large, an incision can be made at or near its cervical junction and the neoplasm enucleated, or it may be removed by an elliptical incision and any remaining remnant shelled out. In large infra-vaginal cervical fibro-myomata this is sometimes not feasible; then the bulk of the growth is removed piecemeal (morcellation) until the base of the tumor can be reached. If the bed is smooth, the wound should be closed at once with a buried suture; but if it is otherwise, the edges of the wound should be trimmed and packed lightly with iodoform gauze.

Small subserous or mixed (subsero-interstitial) fibro-myomata, not exceeding the size of an English walnut, on the anterior surface of the supravaginal portion of the cervix, producing vesical disturbance, have been removed by me several times by cutting the cervico-vaginal junction anteriorly to its full extent, stripping the bladder off the cervix sufficiently to reach the tumor, then making an incision into the tumor through its capsule, enucleating the growth, closing the bed with catgut, and again uniting the first incision.

The after-treatment of the abdominal operation is very simple if the pedicle has not been fastened in the abdominal wound. The patients receive one hypodermic injection of morphine an hour or two after the operation if the pain is very intense. Later no narcotics are permitted. For the thirst I have for the past ten years used hot water, in teaspoonful doses, repeated every half-hour or hour. The Koeberlé wire clamp, if used, is

tightened a little every day, and after the third day the stump is exam-
ined to see whether the process of mummification is progressing properly;
if there is any moisture, it is carefully dried and the stump is touched
with a fifty-per-cent. solution of chloride of zinc, and fresh powder, gauze,
and cotton are applied. The transfixion pins are always guarded by a layer
of gauze beneath them, to prevent pressure on the skin. The clamp usually
comes off from the tenth to the fourteenth day, but sometimes it remains
three weeks. Drainage, although still resorted to under exceptional cir-
cumstances, is practically a thing of the past. It is permissible, however,
when complication with pyosalpinx exists and much pus has come in con-
tact with the peritoneal cavity, and also when many adhesions are present :
the latter are rare in connection with fibro myoma.

Pregnancy.—Pregnancy complicated with these tumors requires
special consideration, and the responsibility resting upon the physician is
an unusual one. In discussing the pathology we have learned that their
growth is rapid during gestation, and hence due appreciation of their seat
is of the utmost importance. A subserous tumor near the fundus should
be treated on the expectant plan. Pelvic tumors, if subserous and more or
less pedunculated, sometimes recede from the pelvis spontaneously; at other
times they can be pushed up and out of the true pelvis during the progress
of labor, and thus delivery can take place unaided or be terminated with
forceps. Sometimes this cannot be accomplished, and we must be ready
to deal with them by abdominal section, this being the only operative pro-
cedure admissible with comparative safety to the mother, and usually afford-
ing a good prognosis to the child. Cæsarean section, followed immediately
by removal of the tumor, is the operation to be performed. In cases of
pelvic fibro-myomata, such as were described as tumors of the supra-vaginal
portion of the cervix, and growths in the lower segment of the uterus,
it must be left to the judgment of the operator whether a Cæsarean section
with or without removal of the ovaries, pan-hysterectomy, or a Porro
operation should be done. The latter should be preferred whenever
practicable.

Interstitial tumors, if gestation is permitted to go to term, are always
best treated by the Porro operation,—supra-vaginal amputation of the
pregnant uterus, with extra-peritoneal treatment of the pedicle. Whether
a Porro operation or a Cæsarean section is contemplated at the time of
the viability of the child, it is always best to make it elective,—that is,
to choose a time which corresponds to a period a few days prior to the
natural termination of the pregnancy. Sometimes it is advisable to do a
myomectomy about the middle of gestation : the cases to be selected for this
are those of broad-based, subserous tumors and such interstitial growths
as we have reason to believe are nearer the peritoneal surface than the
mucosa of the uterus, as manifested by the symptoms prior to pregnancy.

Another very important therapeutic procedure to be considered is the
production of abortion. A positive rule cannot be laid down, but the

following may serve as a guide. If the choice is given at an early period of gestation (up to the third month), abortion should be produced, this being then, with ordinary precautions, practically free from danger; but after the fourth or fifth month I prefer to wait for the termination of gestation and then to do whichever operation is indicated, because at the latter period of gestation abortion is not free from danger; besides, after its accomplishment the patient is not relieved of the tumor. Infra-vaginal tumors of the cervix, if discovered before the sixth or seventh month, should be at once removed, but during the first two and a half to three months they should not be interfered with, on account of the liability to abortion. If not discovered until near the termination of pregnancy, it is just as well to wait until labor has set in and remove the growths then.

Operations for fibro-myomata are ordinarily the cleanest of all abdominal operations, and drainage should be regarded as a complication. Our aim should be to stop bleeding at every point in the peritoneal cavity, so that there shall be no occasion for the draining off of secretions.

The mortality of the operation for the removal of fibro-myomatous tumors differs with individual operators, but depends chiefly upon the kind of tumor, and the circumstances (the physical condition of the patient) under which the operation is done. As to the method of operation, *i.e.*, with intra-peritoneal or extra-peritoneal treatment of the stump, or pan-hysterectomy, statistics are in favor of the first-named; we must not forget, however, that the other operative procedures are as yet in a state of evolution, and that extra-peritoneal treatment of the stump has such obvious disadvantages that it is our duty to seek a method which will overcome them. The mortality in the case of broad-based intra-ligamentous tumors as well as those developing from the supra-vaginal portion of the cervix is large; we can count on twenty-five per cent.; whereas in interstitial tumors of the body of the uterus, for which hysterectomy is done, it is only from ten to fifteen per cent. The average mortality of all abdominal operations for these tumors may be put down as fifteen per cent. in the hands of operators of ordinary skill and experience, castration excepted, in which it should not exceed three per cent. Removal of tumors from the infra-vaginal portion of the cervix should cause no deaths referable to the operation. We have noted that the causes of death are as variable as the operations in vogue; yet the largest death-rate is yielded by sepsis and hemorrhage, or sequelæ due to the latter, complications which are avoidable in pan-hysterectomy, as first performed by Bardenheuer, but promulgated among the profession by August Martin, of Berlin.

CAVERNOUS ANGIOMA OF THE UTERUS.

Angiomata in various portions of the body are quite common, and the theories as to their origin are numerous. In the uterus the existence of such neoplasms is exceedingly rare.

The patient from whom the specimen figured was obtained is thirty-

seven years old and a nullipara.   For nearly a year she had bled more or
less, the hemorrhages during the last four months being profuse and the
intervals short.   A number of curettings with a sharp instrument, with
short intermissions, had only a temporary effect on the metrorrhagia.   The
endometrium showed nothing malignant; only a hyperplastic endometritis
could be diagnosed with the microscope.   The bleeding finally became so
profuse at the expected time of her menstruation that, in view of the pre-
vious failures to cure with the curette and local applications, it was resolved
to do something radical, especially as the patient was becoming very anæ-
mic and much discouraged.   Vaginal hysterectomy was decided upon rather
than castration, first, because it seemed highly probable that she would
be cured if she recovered from the operation ; and, second, although no
malignancy could be shown as yet, it seemed rather suspicious for the
bleeding to recur so persistently shortly after curetting.

After removal of the uterus it was bisected anteriorly, when a tumor
was found, of the size and shape of an English walnut, located in the
anterior upper corner of the organ, and reaching to the fundus.   The
tumor protruded into the uterine cavity, and appeared lobulated, of a dark
mahogany-red color, and of a consistence somewhat firmer than that of the
surrounding uterine walls; it extended, especially in its posterior portion,
a little more than half the thickness of the uterine wall.   Its transverse
section appeared mottled, exhibiting a large number of dark-purplish
and whitish spots, both of which varied in diameter from the trans-
verse section of a raven's quill down to a pin-head.   To the touch
the purplish spots ap-
peared soft, corresponding
to the consistence of re-
cently coagulated blood ;
whereas the consistence of
the whitish spots was very
firm, almost approaching
that of cartilage.   Still
more conspicuous was the
difference in the color of
the circular spots in their
transverse section through
the tumor, where the dark-
purple or blood-colored
circular fields were dis-
tinctly marked from the
whitish spots alluded to.

Fig. 22.

Cavernous angioma of uterus, half size.

With low powers of the microscope the most
striking feature was an abundance of cavities, varying greatly in size and
shape, filled with blood.   Obviously these were transverse sections of large
veins separated from one another by intervening fibrous connective tissue,
in which a considerable number of capillary blood-vessels could be seen.

The blood was not uniformly distributed throughout the veins, some of which showed clots consisting mainly of red blood-corpuscles and comparatively little fibrin; other cavities, on the contrary, held a good deal of fibrin and serum, but not many red blood corpuscles.   This peculiar fact may be accounted for by the circumstance that the blood did not enter all the veins of the tumor, a number of veins being partially or completely obliterated, and consequently presenting an obstacle to the circulation of the blood even within the permeable portions.   With high powers of the microscope the endothelial wall of the permeable cavities could be seen without difficulty : hence the tumor was regarded as a cavernous angioma.   The appearance of the tortuous arteries at the border of the tumor was that of the condition
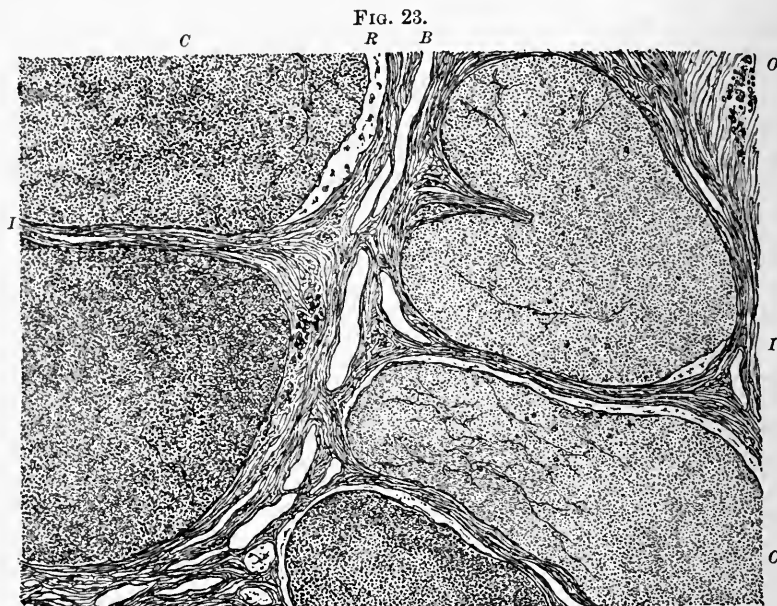
FIG. 23.

C. C. cavernous veins filled with blood and coagulated fibrin; I, I, interstitial fibrous connective tissue; B, capillary blood-vessels in the interstitial tissue; R, light highly refracting rims along the walls of the veins; O, obliterated blood-vessel marked by clusters of pigment.

described by pathologists as waxy degeneration.   The interstitial connective tissue contained at different points a dark yellow-brown pigment which was probably the outcome of previous extravasations of blood.   In other portions there were larger masses of pigment clusters, which, from the configuration of the fields holding such pigment, were considered as the residues of obliterated cavernous veins.   The large venous cavities penetrated into the muscle wall of the uterus, as already stated.   The tortuous arteries and the enlarged capillaries were most numerous at the periphery of the tumor. There was no distinct boundary-line between the peripheral cavernous veins and the adjacent muscle tissue, which latter bordered directly upon the venous cavities.   Small light patches in the interstitial connective tissue admitted of no other explanation than that they were completely obliterated arteries

or capillaries. Considerable interest attaches to the obliteration of the cavernous veins throughout the tumor. Whether the involution of the veins was due to the repeated scraping and subsequent application of carbolic acid I am unable to say with positiveness, but presumably this was the case. A number of the obliterated veins appeared of such peculiar shape that I was forced to believe that the venous cavities were in a collapsed condition when obliteration began. Another possibility is that some parts of the tumor were deprived of blood by preceding obliteration of a certain number of venous cavities, which likewise may have resulted in the locking up of the blood-current and collapse of the veins thereupon.

Fig. 24.

Cavernous angioma of uterus; obliteration of veins, × 50.—P, P, permeable cavernous veins filled with blood; H, half-permeable vein; S, solidified cavernous vein; R, R, hyaline rim around both permeable and solidified veins; O, completely obliterated vein; I, interstitial fibrous connective tissue carrying capillary blood-vessels.

All veins either in the process of obliteration or thoroughly obliterated were marked by hyaline or waxy rims around the walls. Such rims were occasionally found doubled, or even trebled; in the latter instance a narrow rim of medullary tissue could be traced between the waxy layers. The central portions were occupied by either myxomatous or fibrous connective tissue, and in the latter instance the fibrous tissue was often found in hyaline or waxy degeneration. Occasionally a portion of the calibre of the vein remained permeable to blood, whereas a large amount of the previous calibre had disappeared, the vein being transformed into one of the above-named tissues. Again, these tissues were often found intermixed with medullary tissue, which in my specimen was stained deeply with ammoniacal carmine, while the waxy portions took either no carmine or

very little. Another feature was the varying breadth of the waxy rim, which at one periphery was broad, occupying almost the whole previous calibre of the blood-vessel, while the opposite periphery was occupied only by a narrow rim.

In my case the calibre of the previous vein was in a measure still preserved and permeable to blood. The greater amount, however, was solidified and transformed into a myxomatous and myxo-fibrous connective tissue. The latter was unquestionably the outcome of a proliferation of the endothelial wall of the vein, much in the manner in which arteries

FIG. 25.
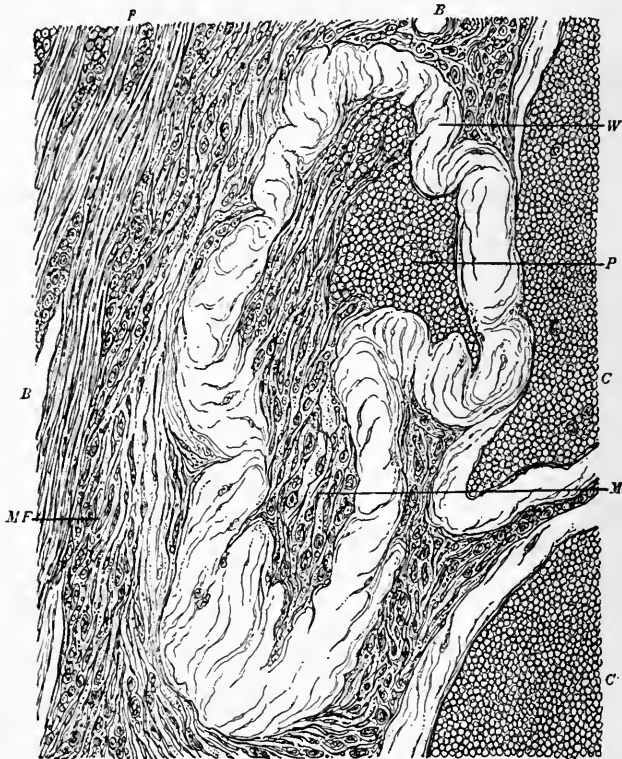
Cavernous angioma of uterus; obliteration of veins, × 200.— W, wall of vein in waxy infiltration; P, permeable portion of calibre filled with blood; M, myxomatous tissue filling the interior of vein; C, C, cavernous veins bordered by a rim in waxy infiltration; F, fibrous connective tissue; MF, myxofibrous connective tissue; B, B, capillary blood-vessels.

are rendered solid in the process of endarteritis obliterans by an outgrowth of the endothelium. Around the partially obliterated vein was seen myxofibrous tissue, obviously the outcome of an inflammatory process accompanying or preceding the obliteration of the vessel. Then followed the smooth muscle wall of the uterus, in which were clusters of medullary or inflammatory corpuscles in the interstitial connective tissue, either the outcome of inflammation or the first step towards the new formation of cavernous angioma, an extension of the tumor from its periphery. There are good reasons

for upholding the latter view, especially because of the presence of hæma-toblasts or undeveloped red blood-corpuscles within the medullary nests. To-day it is fully admitted that Rokitansky's assertion, made fifty years ago, that the formation of red blood-corpuscles precedes the formation of cavernous angioma, is correct.   How peculiar the outcome of obliteration of a cavernous vein may be is shown in Fig. 26.   Here the convolutions of the waxy rim are so pronounced that one is almost compelled to believe that the vein was collapsed and empty before the process of obliteration began.   The convoluted rim here is but faintly striated, and contains a limited number of branching protoplasmic or fibrous tracts.   This means

FIG. 26.
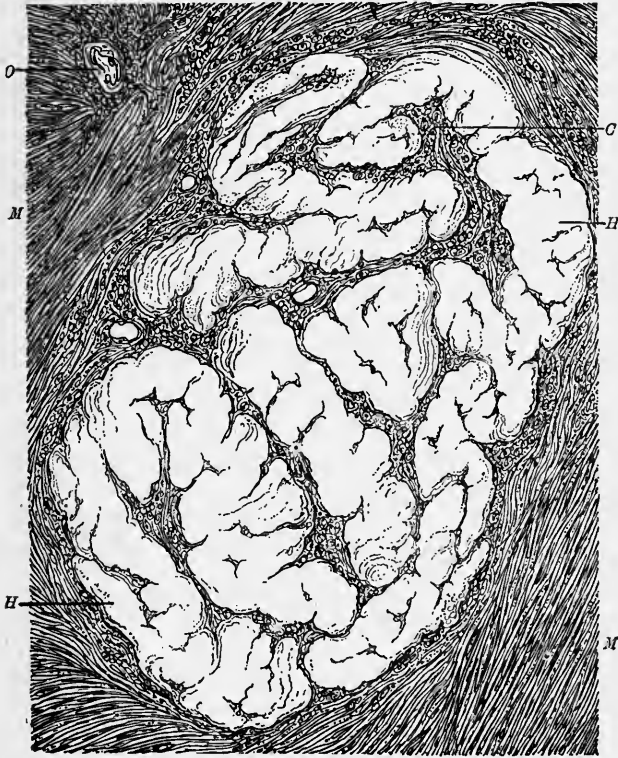
Obliterated vein, × 200.—*H, H*, hyaline convoluted tracts; *C*, medullary and fibrous tissue between the convolutions; *M, M*, smooth muscle-bundles of uterus; *O*, obliterated capillary or artery.

a high grade of waxy infiltration.   Between the convolutions we notice tracts of medullary tissue intermixed with fibrous connective tissue.   The supply of this tissue with capillary blood-vessels is small.   The whole formation is surrounded by a zone of medullary tissue directly bordering upon unchanged smooth muscle tissue.   In the left upper corner we notice a waxy patch, evidently an obliterated capillary or artery.   What the waxy rim is can be determined only with higher powers of the microscope.

From a histological stand-point I would not hesitate to compare the

waxy rims of the cavernous veins with an anomalous formation of carti-
laginous tissue in certain chondromata. The basis substance is in both
instances not devoid of structure, being traversed by an exceedingly deli-
cate reticulum of living matter, discernible with a power of six hundred
diameters, in the shape of branching tracts of minute granules. Only one
other case of cavernous angioma of the uterus is as yet on record, that
described by Klob in his " Pathologische Anatomie der weiblichen Sexual-
organe," page 173.

FIG. 27.
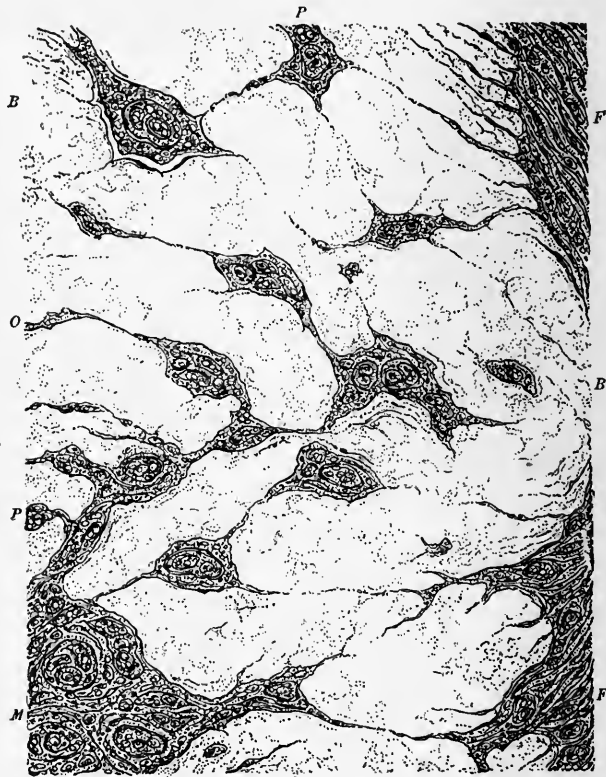
Cartilaginous rim of obliterated vein in cavernous angioma of uterus, × 600.—*M*, medullary tissue
in centre of obliterated vein; *F, F,* fibrous tissue on periphery of obliterated vein; *P, P,* coarsely
granular protoplasmic bodies; *O,* offshoot of protoplasmic body; *B, B,* cartilaginous basis substance.

From the facts described I have little doubt that the tumor was slowly
progressive, though partially, at least, healing by the obliteration of a
number of veins. In consequence of the almost constant bleeding, ex-
tirpation of the organ was a perfectly legitimate procedure. Another
deduction may be made from this case,—that it was not the curetting
which gave the temporary relief, so much as the local use of pure carbolic
acid. On the contrary, the bleeding was always quite profuse when the
curette was used.

ADENOMA.

Glandular tumors are of frequent occurrence in the cervix as well as in the body of the uterus. Allusion has been made on a preceding page to a combination of glandular new formation with myxomatous tissue. Since glandular tissue cannot exist without some adjacent myxomatous or fibrous connective tissue, the name adenoma will be applied only to glandular

FIG. 28.

Chronic endometritis fungosa with acute recurrences, × 100.—L^1, utricular gland in longitudinal section; T, T, utricular glands in transverse section; W, slightly widened utricular gland; F, fibrous connective tissue between the glands; L^2, accumulation of lymph-corpuscles, denoting acute inflammation; A, artery; C, C, capillaries.

tumors in which the epithelial new formation is prevalent. In the cervix these lead to prominent raspberry-like formations protruding over the surface of the mucosa. They undergo cystic degeneration, and then produce what older gynæcologists have erroneously termed ovules of Naboth.

Lympho-Adenoma.—This name I propose for a morbid process in the mucosa of the uterus hitherto but little understood, and frequently mistaken for fungous or glandular endometritis. The so-called fungous endometritis, like any other inflammatory process, is confined to the interstitial lymph

tissue, and at the utmost may lead to an enlargement of the utricular glands with a simultaneous widening of their calibres.

No pathologist will admit that an inflammatory process will cause a new formation of glandular structures; yet we frequently meet, in fungous endometritis, with a large number of utricular glands, freely bifurcating and exhibiting alternate widening and constriction of the tubules. Such a condition cannot be simply the result of inflammation, but must be considered as a neoplasm; and since both elements of the uterine mucosa, the

FIG. 29.
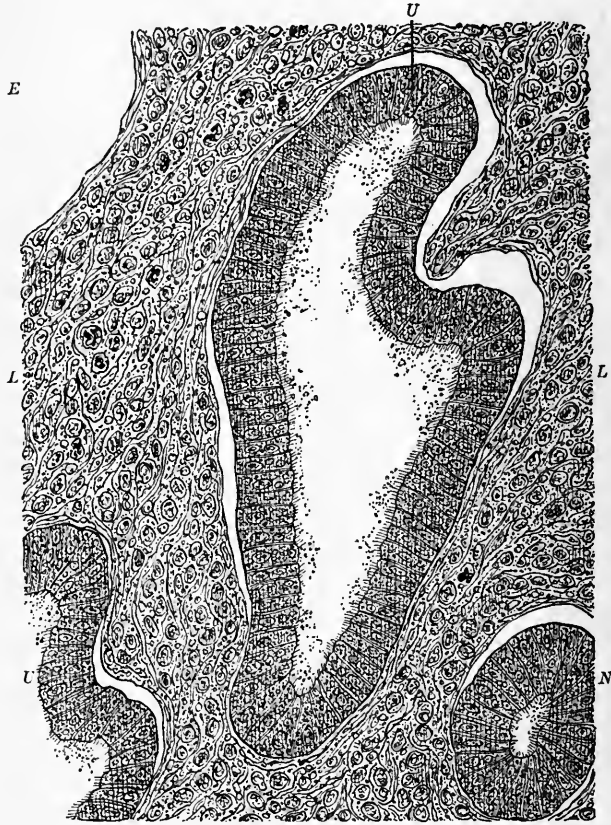
Lympho-adenoma of uterine mucosa, × 500.—*E*, empty space of utricular gland; *U, U,* newly-formed utricular glands with wide calibres; *L, L,* lymph-tissue; *N,* normal utricular gland in transverse section.

lymphatic as well as the glandular tissue, are noticeably augmented in bulk and increased in size, the term lympho-adenoma becomes applicable. Although other writers speak of a benign adenoma (Ruge, Veit, Pozzi, and others), no sufficient differentiation has as yet been attempted between a simple inflammatory process and a new formation of tissue.

The term fungous endometritis is, in my opinion, applicable only to a slight nodular thickening of the mucosa, in which the microscope reveals a considerable increase in lymph-corpuscles, but no augmentation of the

utricular glands. At most some of the tubules may exhibit moderate widening of their calibres. Lympho-adenoma, on the contrary, will produce nodulated protrusions over the mucosa, frequently of considerable size, and the microscope shows not only an increase in the number of the lymph-corpuscles, but also a pronounced increase in the number of the utricular glands. In fungous endometritis an augmentation of the number of lymph-corpuscles occurs only in the acute stage; when the process be-
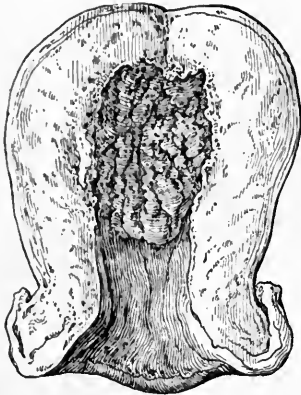
FIG. 30.
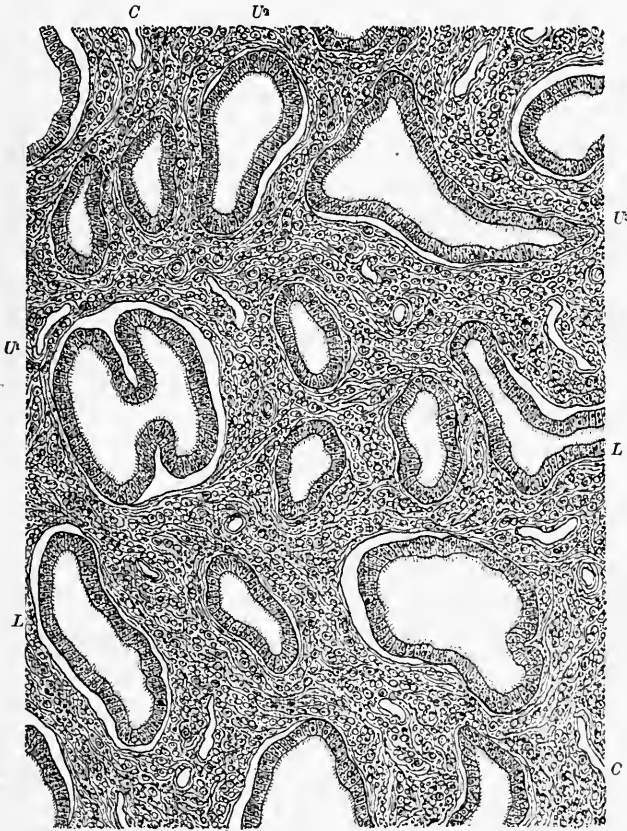
Lympho-adenoma of uterine mucosa, × 100 — U^1, utricular gland with folded epithelial lining; U^2, three successive transverse sections of a utricular gland; U^3, oblique section of a utricular gland; L, L, lymph-tissue; C, C, capillary blood-vessels.

comes chronic they will decrease in number and the original myxomatous net-work will be transformed into myxo-fibrous or even fibrous connective tissue, terminating in atrophy of the mucosa. In such a case the utricular glands are conspicuously diminished in number and some of them are found transformed into cysts. In lympho-adenoma the number of the lymph-corpuscles is not so considerably augmented as in acute hyperplastic endometritis, but, the disease being progressive, as in all tumors, atrophy of the lymphoid tissue will not take place. In both instances hemorrhages

occur. In fungous endometritis simple curetting and local applications will effect a cure; in lympho-adenoma, on the contrary, such a procedure will result in a permanent cure only if the disease is not far advanced and is confined to a small area. In spite of repeated curetting, the hemorrhages may recur, so that vaginal hysterectomy is indicated.

FIG. 31.

Lympho-adenoma of uterus (benign adenoma).—Uterus was extirpated on account of recurrences after curetting.

The microscope furnishes the only means of deciding whether we have to deal with simple fungous endometritis or with progressive lympho-adenoma. The microscopic examination of the scrapings becomes still more important when it is necessary to determine whether we have to deal with a benign lympho-adenoma or with an incipient myeloma (sarcoma). L. Heitzmann in 1887 called attention to the fact that in the early stage of myeloma the epi-

FIG. 32.
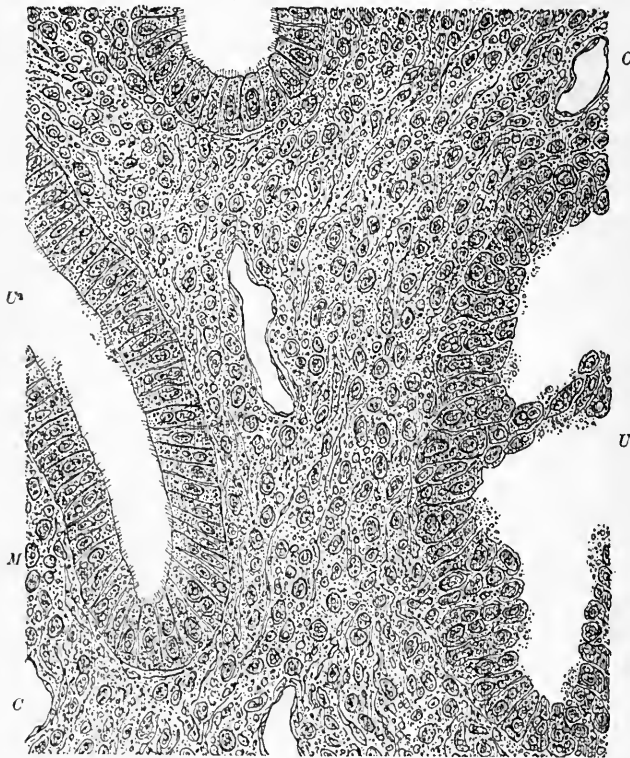
Transformation of epithelia of utricular glands into myeloma tissue. From a specimen of Charles D. Jones's, × 500.—U^1, utricular gland with normal epithelia; U^2, utricular gland whose epithelia are coarsely granular and have augmented nuclei; U^3, utricular gland with epithelia partly transformed into myeloma tissue; M, M, lympho myeloma; C, capillary blood-vessels.

thelia of the utricular glands will soon become transformed into myeloma elements. This will occur indifferently whether the sarcoma attacks a normal or an inflamed uterine mucosa. Heitzmann's assertion has attracted little attention; but my own numerous microscopical researches in this line have convinced me that it is correct. So long as the epithelial layer of the utricular gland is perfect, we may have to deal with fungous endometritis or lympho-adenoma, but the process will invariably be a benign one. When, on the contrary, we find the epithelia of some utricular glands transformed into lymph-corpuscles, penetrating even into the calibre, the diagnosis of lympho-myeloma (small round-celled sarcoma of Virchow) is established. As soon as this diagnosis is reached, the removal of the uterus is the only means of saving the patient's life.

Quite recently Charles D. Jones has examined a number of scrapings and uteri extirpated on account of the diagnosis of lympho-myeloma made on microscopical examination of the scrapings. To this gentleman I am indebted for the accompanying drawing (Fig. 32).

The microscopical examination of scrapings in such cases is the more important since it enables us to recognize malignant disease at the earliest stages of its development, and by prompt removal of the uterus to save the patient's life.

38

CHAPTER XII.

MALIGNANT NEOPLASMS OF THE UTERUS.

BY HERMANN J. BOLDT, M.D.

MYELOMA OR SARCOMA.

THESE malignant tumors were for a long time considered to be rare. To-day we know that they are not of exceptional occurrence. The clinical features I shall not dwell upon, since all that will be said of cancerous tumors holds good for sarcomatous. They are equally infectious, therefore equally malignant, and the symptoms are much the same in both.

Virchow has distinguished three varieties of sarcoma : (1) the round-celled, (2) the spindle-celled, and (3) myxo-sarcoma. A fourth variety has recently been added to this list by Sänger, sarcoma deciduo-cellulare.

The round-celled sarcoma of Virchow is the most common form. The small round-celled sarcoma, or, as I would prefer to term it, lympho-myeloma, is far more common than the large round-celled sarcoma of Virchow, or globo-myeloma. Whenever a diagnosis is necessary on account of frequent hemorrhages from the uterus, the cervix should be dilated and the mucosa curetted with a sharp instrument, both for diagnostic and for therapeutic purposes.

The diagnosis of lympho-adenoma, a benign form of tumor, is established when the utricular glands are found not only widened, but increased in number, and the epithelial lining unbroken, being composed of columnar ciliated cells. The adjacent myxomatous lymph-tissue may be increased in a varying degree and crowded with small non-nucleated bodies, the lymph-corpuscles. So long as the epithelial layer is unbroken, the diagnosis of benign lympho-adenoma is permissible, as is illustrated and explained more fully in the section on adenoma.

The condition is quite different when the original lympho-adenoma or the previously unchanged mucosa of the uterus becomes affected with lympho-myeloma. In this case we notice first an increase in the bulk of the nuclei of the columnar epithelia ; next some of the neighboring epithelia lose their intervening cement-substance and fuse together, forming multi-nuclear protoplasmic bodies, which finally split up into a large number of small solid or vacuolated bodies, thus accomplishing the transformation into lympho-myeloma.

L. Heitzmann and recently Charles D. Jones have called attention to

594

this fact. The latter examined the mucosa of several uteri extirpated on account of the diagnosis "incipient myeloma," made after the microscopical examination of pieces removed with the curette, and found more or less advanced myeloma. There is a possibility of recognizing under the microscope the earliest stages of a myelomatous growth by means of the changes in the epithelia. We frequently notice an interruption in the epithelia of the utricular glands, through which the myelomatous tissue penetrates the calibre of the glands. In an advanced stage only vestiges of the previous epithelia are discernible, the whole tissue consisting of a more or less vacuolated lympho-myeloma.

FIG. 1.

Small spindle-celled sarcoma of uterus, × 500.—L, L, longitudinal bundles of spindles; T, T, transverse sections of bundles; O, O, oblique sections of bundles; A, artery collapsed; C, C, capillaries.

Spindle myeloma is comparatively rare, and is composed of spindle-shaped protoplasmic bodies with irregular, coarsely granular nuclei, freely interlacing and somewhat resembling fibro-myoma. I observed a case of this variety of tumor which started from the body of the uterus and extended to the broad ligament, the tubes, and one of the ovaries. All the tissues of the organs named were transformed into spindle-shaped myeloma-corpuscles. The diagnosis of this tumor was made from scrapings, and extirpation of the uterus and adnexa was performed. The microscopical appearance of the tumor is represented in Fig. 1.

FIG. 2.

Small spindle-celled sarcoma of uterus and adnexa : posterior view, one-half natural size.

FIG. 3.
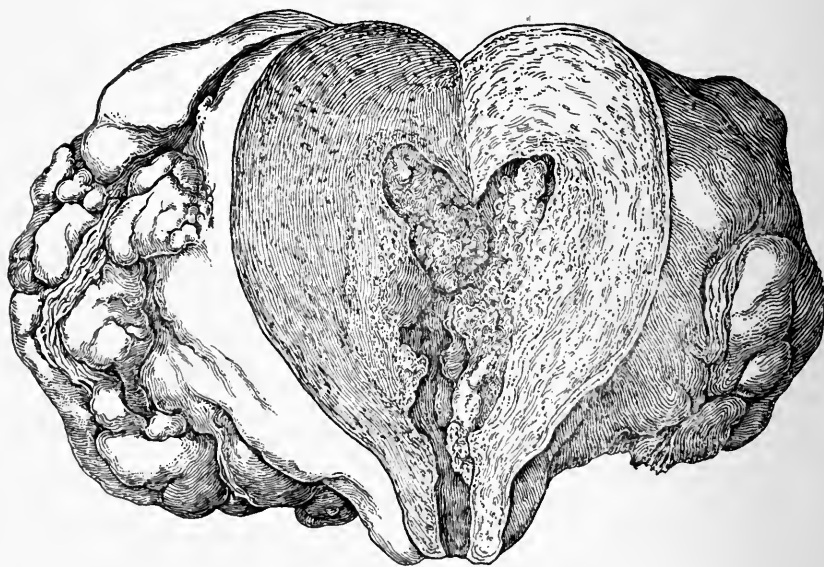
Small spindle-celled sarcoma, showing interior of uterus.

MALIGNANT DECIDUOMA (SARCOMA UTERI DECIDUO-CELLULARE).

Although many authorities dispute this variety of sarcoma as a particular form, deeming it simply a mixed sarcoma, Martin Sänger insists upon its origin from decidual elements, because the protoplasmic bodies constituting the tumor exhibit a close resemblance to decidual elements, and also because, thus far, the neoplasm has been found only in patients who shortly prior to its observation were pregnant.

FIG. 4.
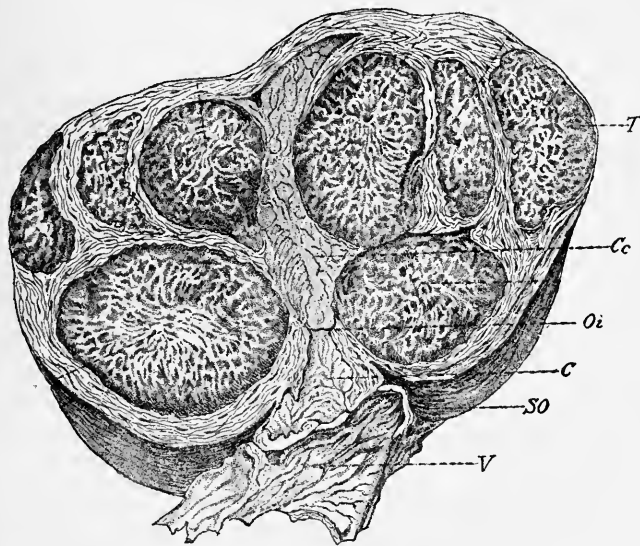
Malignant deciduoma.—*T*, neoplasm; *Cc*, cavity of uterine body; *Oi*, internal os; *C*, cervix; *SO*, peritoneal surface of the uterus; *V*, vagina. (Sänger.)

The symptoms are similar to those of some retained secundines after delivery or abortion. The prognosis is favorable only if the condition is recognized very early and the diseased uterus then immediately extirpated.

The recognition is based upon a microscopical examination by a competent pathologist of the débris obtained by the use of a *sharp* curette, which should be done in all cases of prolonged sanguineous discharge after premature or normal evacuation of the products of conception.

If the disease is allowed to run its natural course, death ensues in from seven to twelve months from complications similar to those in cancer.

One case was seen in consultation by me. A woman aged thirty-three years had aborted at about the fourth month. Shortly after abortion sanguineous discharges again occurred, and she was curetted by her family physician, under the impression that placental remnants were left *in utero*. When seen by me about four months subsequently, the uterus

was greatly enlarged and the patient anæmic.   An examination of the débris resulted in the diagnosis of a peculiar form of sarcoma.   The patient died a few months subsequently of asthenia, pleurisy with effusion having previously taken place.   Unfortunately, no post-mortem was permitted.

CANCER OF THE UTERUS.

This disease occurs most frequently between the ages of forty-five and fifty years, although early periods of life are not exempt.   I have seen several cases in patients between twenty and thirty which were too far advanced for radical operation.

It was formerly thought that it was limited to the cervix; later experience, however, especially since vaginal hysterectomy has been generally performed, has shown that cancer of the corpus uteri, although not nearly so frequent as cervical carcinoma, is not rare.

For clinical reasons cancer of the body will be considered separately from cancer of the cervix.   Cancer of the portio vaginalis, the so-called "cauliflower growth," has no tendency to invade the uterine mucosa, though exceptions to this rule occur.   The papillary growth begins on the surface, and the thickened epithelial covering extends into the depths of the portio, when, breaking down, new papillæ are formed, which subsequently undergo necrotic destruction; or it is of a fungous appearance, sometimes partly filling the vagina, and hiding the cervical opening beneath it.   Although it remains limited for a considerable period to the part from which it originated, in the course of time the periuterine tissues and the vagina will be involved, or it may spread along the cervical canal.

It is conceded that there is always an inflammation of the endometrium accompanying cancer of the cervix, but the truth of the assertion of Abel and Landau, that the lesion is sarcoma, is greatly doubted and even denied by many; yet those authors have shown me specimens which were sarcomatous beyond a doubt.   In other cases cancer of the cervix begins in the form of a nodule situated beneath the mucous membrane, and this is not transformed into an ulcerating surface until the disease has been present for a comparatively long time.   When cancer begins in the cervical mucous membrane, it rapidly causes destruction of the cervix; and though the disease may not be noticeable on inspection, the introduction of the finger into the cervical canal will often show this to be extensively destroyed. The broad ligaments become affected early, and not seldom the lining membrane of the corporal endometrium.   In all varieties of cancer the advanced stages resemble one another in consequence of induration of the broad ligaments and the presence of a greater or less amount of exudative material in the pelvis which is of either an inflammatory or a malignant character, and produces pressure upon the vessels and nerves and not rarely upon the ureters : hence in such advanced stages the patients have intense pains in the pelvis and lower extremities.

The uterus under such circumstances is firmly fixed and immobile to

the touch; the bladder is also frequently involved by the extension of the disease. In consequence of the necrotic process a vesico-vaginal fistula is formed; the rectum is only exceptionally affected. Kidney lesions are very common in connection with cancer of the uterus: for example, hydro-nephrosis may be produced by compression of the ureters, especially near their insertion into the bladder.

Pathology of Cancer of the Uterus.—Cancer of the cervix is generally divided into several varieties with reference to its seat, such as cancer of the portio vaginalis, cancer of the supra-vaginal portion of the cervix or of the cervix proper, and cancer of the mucosa lining the cervix. I lay no stress upon the localization, since this is of comparatively small importance to the practitioner.

In the cervical portion of the uterus we meet mainly with four varieties of carcinoma: (1) dermoid, (2) scirrhus, (3) adenoid, and (4) medullary.

1. *Dermoid cancer* is of comparatively rare occurrence. Under the microscope it exhibits nests and pegs, composed of flat epithelia, containing lumps of colloid masses, the so-called cancer pearls. For illustration, I refer the reader to the chapter on neoplasms of the vulva (Fig. 9).

It is this form which produces pronounced papillary elevations on the surface of the mucosa, assuming later the aspect of a so-called cauliflower growth. The epithelial depressions between the papillary connective-tissue formations, as such, arouse the suspicion of an incipient cancer, especially when some of the epithelia are enlarged and show an increase in the size of their nuclei, or a splitting of the latter into several lumps,—so-called endogenous new formation.

FIG. 5.

Villous cancer of the vaginal portion of the uterus (so-called cauliflower growth) combined with fibro-myoma of the fundus uteri, double hydrosalpinx, and cystic ovaries.—*M*, fibro-myoma; *R*, right ovary and tube; *L*, left ovary and tube; *C*, amputated cancer of vaginal portion.

The fibrous connective tissue produces long and narrow papillary elevations, frequently with finger-like branches; their blood-vessels are rather numerous wide capillaries, and the connective tissue is more or less crowded

with so-called inflammatory corpuscles, or, according to Virchow, is in a condition of small-celled infiltration which to-day we consider the incipient stage of cancer, since we know that the more pronounced is the infiltration of the connective tissue the more malignant is the type of cancer.

2. *Scirrhus.*—This is likewise a rare form, and always occurs in the depth of the tissue. (See Fig. 13.) It consists of nests, either isolated or in associated alveoli, filled with small, distinctly polyhedral epithelia. Between the nests there is a large amount of dense fibrous connective tissue,

FIG. 6.
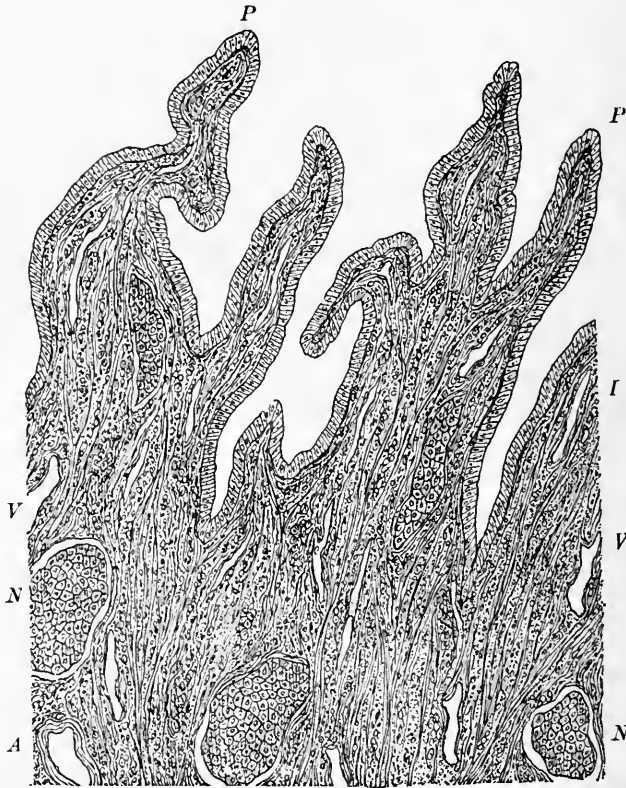
Papillary or villous cancer of the vaginal portion of the uterus (so-called **cauliflower growth**).— *P, P,* papillæ on surface of tumor, lined by columnar epithelia; *I,* fibrous connective tissue in inflammatory infiltration; *N, N,* cancer-nests in deeper portions; *V, V,* veins; *A,* artery.

lacking the small-celled infiltration seen in the initial stages. Obviously this form cannot be diagnosed under the microscope if clippings from the surface of the mucosa are examined. The surface, as a rule, shows only papillary excrescences, freely supplied with blood-vessels, and covered with a single row of ciliated columnar epithelia of a normal appearance.
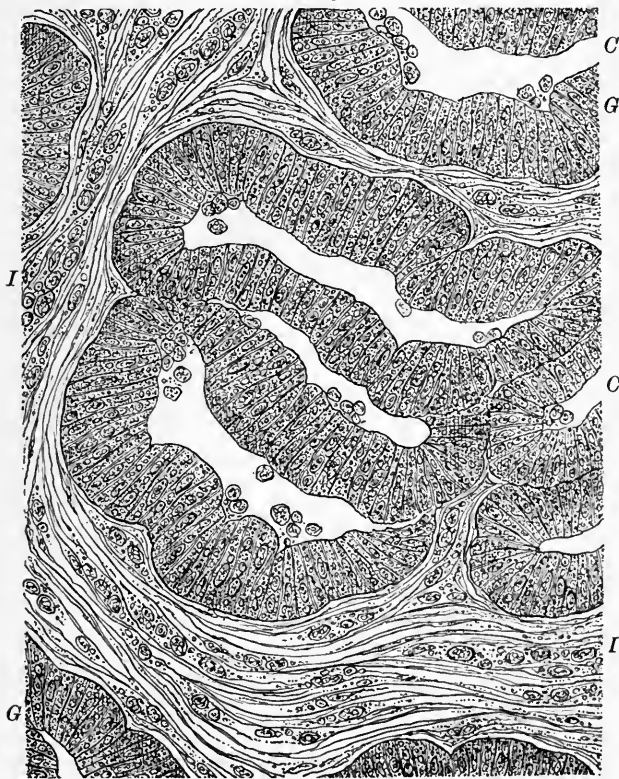
3. *Adenoid cancer* is the most common form, and sooner or later changes into the medullary type. (See Fig. 8.) At first we notice under the microscope, aside from papillary elevations on the surface, numerous

FIG. 7.
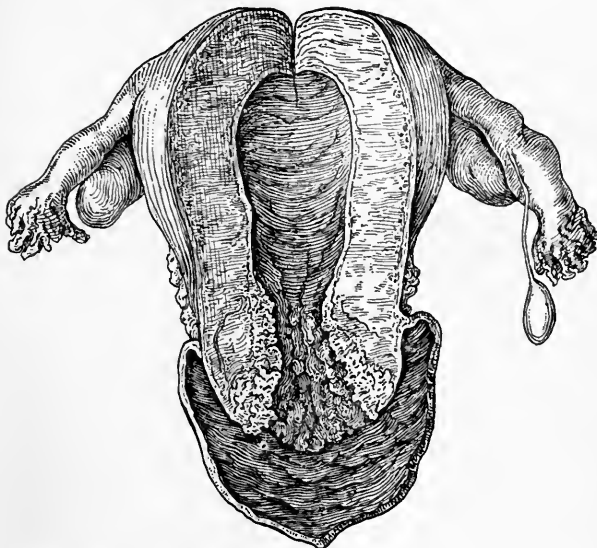
Cancer of cervix, the disease starting in the cervical mucous membrane.

FIG. 8.

Adenoid cancer of mucosa of uterus, × 500.—G, G, hyperplastic utricular glands, lined with columnar epithelia; C, C, irregular calibres holding corpuscles; I, I, inflammatory infiltration of fibrous connective tissue.

tubular glands coursing irregularly in the fibrous connective tissue, an appearance which we may describe as adenoma.   As soon, however, as we notice clusters of protoplasmic bodies in the connective tissue in the neighborhood of the newly-formed glands, we are enabled to determine the presence of the preliminary stage of cancer.   Experience has taught us that every adenoma of the cervix uteri is prone to change into cancer, and this is indicated by incipient infiltration of the connective tissue with small

FIG. 9.
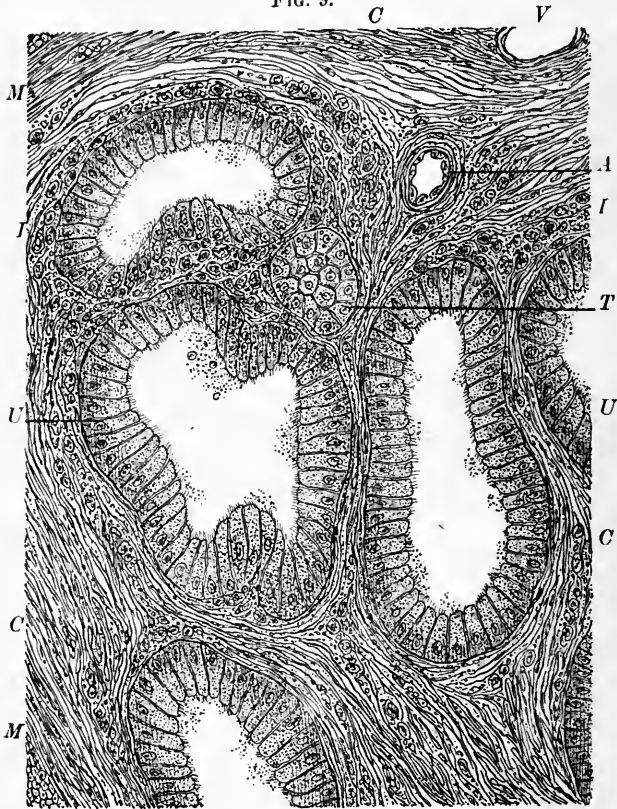
Adenomatous stage of carcinoma of the cervix uteri, $\times$ 250.— U, U, utricular glands, the columnar epithelia in small portions coarsely granular; T, segment of a utricular gland, the epithelia in top view; I, I, so-called small-celled infiltration of connective tissue on the borders of utricular glands; C, C, fibrous connective tissue; M, M, smooth muscle-bundles in longitudinal and transverse sections; A, artery; V, vein.

protoplasmic bodies.   The diagnosis "cancer" is thoroughly established when we observe the newly-formed tubular glands branching and with partly widened calibres.   Along the epithelial lining we see a varying number of epithelia, with nuclei augmented both in size and in number. Preceding this we note karyokinetic figures in the nuclei, indicating a more rapid outgrowth of the living matter within the protoplasm of the epithelia. In pronounced cases of adenoid cancer the tubules exhibit manifold convolutions, and frequently only one side of the wall of the contorted tubule

is discernible, the rest having perished in a crowd of protoplasmic bodies varying in aspect from a small solid lump to a larger globular, nucleated, protoplasmic mass.   Even at the height of this infiltration, which means a transition to the medullary type, we frequently notice single or clustered, somewhat angular, bodies, vestiges of previous epithelia.

4. *Medullary Cancer.*—This is the most malignant form, and usually arises from an adenoid cancer (see Fig. 8), though any variety of cancer, including dermoid and scirrhus, may in the course of time be transformed

FIG. 10.
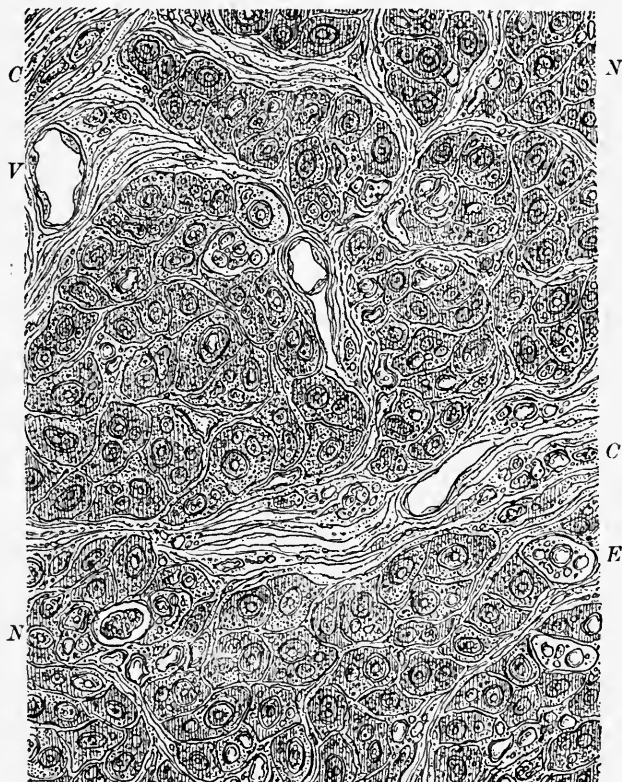
Medullary cancer of uterus, × 500.—*C, C*, fibrous connective tissue crowded with protoplasmic bodies; *V*, vein in transverse section; *N, N*, epithelial nests; *E*, endogenous new formation of living matter.

into medullary.   The diagnosis of this form is easy enough so long as we find vestiges of previous tubular glands, consisting of a single row of columnar epithelia or clusters of such epithelia.   It is difficult, or may even be impossible, when such vestiges are absent.   In the latter instance we meet with protoplasmic bodies of varying sizes and shapes closely packed together, holding, as a rule, only scanty, wide capillaries.   These are the cases which were termed by former pathologists encephaloid tumors, owing to their resemblance to brain-tissue.   Virchow first maintained that cancer may lose its histological characteristics and assume those of sarcoma, an

assertion the correctness of which, originally much doubted, may to-day be considered established.

The cancerous origin of the tumor is indicated by the greatly varying sizes and shapes of the protoplasmic bodies, which in myeloma (sarcoma) are more uniform.   Evidently, Abel and Landau examined cases in which a medullary cancer had attained its ultimate and most malignant stage, that of myeloma.

To the clinician this is of small importance, because medullary cancer and myeloma are equally dangerous to life.   Some authors speak of a flat ulcer upon the mucosa of the cervix as a form of cancer.   As mentioned previously, ulcers due to lacerations or to the corrosive properties of the endometrial discharge may become the seat of cancer.   The latter diagnosis becomes admissible only if we are able to establish the presence of an outgrowth of the epithelial structure, which in simple ulcers is more or less destroyed, but is never augmented.

Etiology.—We may consider a long-continued cervical catarrh with erosions, and also cervical lacerations causing such pathological changes, as direct etiological factors.   I myself have seen one case in which the primary seat of the cancer was in the angle of the laceration.   Age, as has been noted, is a predisposing factor.

Symptoms.—Unfortunately for the patients, the beginning stage of cancer of the cervix causes no symptoms.   It is not until the neoplasm begins to ulcerate that bleeding and leucorrhoeal discharges are usually present, although occasionally an irregular "spotting of blood" may be noticed, which is not due to an ulcerating cancer, but to accompanying inflammation of the lining membrane of the uterus.   Frequently the first evidence is a slight bloody discharge after coitus.   If the disease makes its appearance during the period of sexual activity, the hemorrhage manifests itself only in a more prolonged and profuse menstruation.   Very often the sanguineous discharge which occurs after the menopause assumes the appearance of expressed meat juice.   This appearance is also found sometimes in the early stage of dermoid cancer.

A vaginal discharge having an offensive odor, whether mixed with blood or not, should always arouse suspicion, especially if profuse and occurring in a woman over thirty-five years old.   Although the bleeding is not generally profuse, I have seen as the first symptom alarming to the patient a copious hemorrhage, which continued to a less extent for several days.   This symptom can be explained only by a rupture of a large blood-vessel in the tissue necrosed by the process of ulceration.   The continuous oozing of blood so often seen is caused by a rupture of the dilated capillaries in the ulcerating neoplasm.   Among the earliest symptoms, then, we must class bleeding, in the form either of spotting or of prolonged or irregular menstruation, and offensive leucorrhoea.

Pain is not a characteristic symptom until the neoplasm has encroached upon tissues outside of the uterus, except in cases—by no means rare—

where a concomitant pelvic inflammation exists. When, however, the malignant infiltration has passed into the broad ligaments and the pelvic peritoneum, variable pains are present, which resemble those of pelvic peritonitis, and consist of backache, hypogastric pains, and inguinal pains frequently radiating down the thighs, caused by pressure upon the nerves. They are often described as lancinating in character. When vesical symptoms are present, it is a certain sign that the disease has encroached upon the cellular tissue between the bladder and the cervix. The presence of rectal symptoms may be ascribed to inflammation of the peritoneum forming Douglas's pouch. Œdema of the lower extremities may occur in consequence of thrombosis of the veins or of the marasmic state of the patient, which produces an hydræmic condition of the blood. The nutrition of the patient suffers very much, the digestion is greatly impaired, vomiting is not rare, and loss of appetite is a prominent symptom. The skin assumes a pale-yellow tint, usually described as the cancerous cachexia. The cystitis which so frequently is present is very painful. Eventually, in many cases, uræmia more or less pronounced develops; it is caused by pressure on the ureters, either by the malignant neoplasm or through distortion of the ducts by inflammatory changes in the pelvic cellular tissue. When a vesico-vaginal fistula has formed by the ulcerative process penetrating the bladder, the painful symptoms of cystitis are relieved; but the discomfort of being constantly wet and soiled is almost as distressing to such patients.

The cause of death is, in the majority of cases, exhaustion; next to this, peritonitis is the most frequent factor. Among other conditions leading to a fatal issue may be mentioned thrombosis of the large pelvic veins, as the common and internal iliac, etc., which sometimes gives rise to pyæmia. Pyelonephritis, embolism of the pulmonary artery, pneumonia, pleurisy, uræmia, the formation of secondary tumors in distant organs, such as the lungs, liver, kidneys, etc., may all be enumerated among the direct causes of a fatal termination of uterine cancer. Pregnancy occurs in many cases of cancer of the portio vaginalis, and it has seemed to me that the disease, under such conditions, progresses more rapidly. When conception does take place, abortion is apt to occur; yet not a few such patients carry to full term. Hanks says that abortion takes place about the third month; although this is correct, it is not due to the fact that the patient has cancer, but rather to the coexisting endometritis, which, as experience teaches, favors the occurrence of abortion at that period of gestation. The accompanying endometritis and the diseased condition of the cervix are, however, to a great extent hinderances to conception.

Diagnosis.—The early stage of cancer of the cervix can never be diagnosed with certainty without a microscopical examination of an excised piece of the suspected part, and even with this aid it is by no means always easy to decide the question; in fact, it is sometimes impossible, so that the clinical features must often settle our course of procedure, and in some cases we are justified in proceeding with a minor operation rather than in wait-

ing long for the case to clear up. The malignant disease may resemble a follicular erosion, though it differs from it in having somewhat elevated and indurated edges. The raw surface in both conditions may bleed with equal readiness on manipulation, but if papillary projections are already present, in cancer these break down with much greater readiness on being scraped lightly with the finger-nail. There is a possibility of mistaking cancer for a submucous fibro-myoma protruding from the os externum, especially when this is becoming gangrenous; yet, if care be exercised, the healthy ring of cervical tissue will be found, on examination, encircling the benign neoplasm. Still more difficult will the diagnosis be if the disease begins in the cervical canal; it may have made considerable progress, and yet there may be nothing abnormal in appearance, the portio being seemingly normal; but when the tip of the finger or a sound is introduced into the canal, a considerable cavity may already be present. The chief clinical distinction between beginning cancer and cervical endometritis will be found in the fact that the discharge in the latter condition retains its mucous consistency, which is always lost in cancer. The sanguineous discoloration and offensive odor are sometimes present in endometritis. Great difficulty in making a diagnosis is experienced when cancer assumes the form of a nodule beneath the vagino-cervical mucosa, before it begins to break down. We may suspect such a nodule to be malignant if it is hard and protuberant, the exterior being of a bluish-red color, and the patient more than thirty-five years old. We should always, under such circumstances, excise a piece for microscopical examination. Advanced stages of cancer of any part of the cervix are readily diagnosed, but in such instances it is usually impossible to recognize from what part of the cervix the malignant disease originated.

Fig. 11.

Side retractor.

Treatment of Cancer of the Uterus. —This may be divided into palliative and radical. The former is indicated in all cases where the disease has progressed to such an extent that the malignant structure apparently cannot be removed *in toto*. Among the various remedies and forms of treatment, that which has stood the test best is curettage, with subsequent cauterization with the Paquelin or the galvano-cautery. The course to be pursued is preparation of the patient as for vaginal hysterectomy, the instruments consisting of a speculum to depress the perineum, one for the anterior vaginal wall, with attachment for constant irrigation, and side retractors. (Fig. 11.) One or two volsellæ, two bullet-forceps, a needle-holder, two full-curved needles, and a large sharp curette or scoop make up the armamentarium, which requires sterilization.

Other needful accessories are a Paquelin cautery, a uterine dressing forceps, heavy catgut or silk (to tie the uterine arteries, if necessary), a sufficient number of pledgets of absorbent cotton, and five- to ten-per-cent. iodoform gauze in strips two inches wide. The patient is anæsthetized, and then placed in the dorsal position. All tissue readily removable is gouged out with the large sharp curette or scoop, under continuous irrigation; then the bleeding is stopped as much as possible by packing strips of iodoform gauze tightly into the cavity, leaving it in contact a few minutes, and then removing it. Then the round ball point of a Paquelin cautery at a red heat is used to cauterize thoroughly the interior. Subsequently, douches of a solution of boric acid (1 to 20) may be used. Another very efficient treatment is to pack the crater, after curettage, with pledgets of absorbent cotton as large as an English walnut, which have been impregnated with a fifty-per-cent. solution of chloride of zinc. A non-absorbent cotton tampon is placed over these. Any chloride of zinc that may have come in contact with the vaginal mucous membrane is neutralized by a saturated solution of bicarbonate of sodium. The chloride of zinc produces a still further separation of cancerous tissue, and in about a week or ten days the slough will have loosened sufficiently to be removed. Iodoform gauze may be packed in the excavation in case of any bleeding after separation of the slough. Later, should the discharge become very offensive, and if a second curettage with subsequent cauterization is contra-indicated, subnitrate of bismuth mixed with aristol or iodoform may be dusted into the cavity. Antiseptic douches are of great value. Not infrequently the disease has progressed so far that it may happen that the uterus is pierced with the curette during the operation. If rigid antisepsis has been adhered to and the operation is stopped at once, this will not be apt to produce a serious result.

Dr. John Byrne, of Brooklyn, uses the galvano-cautery for his work, and in an address before the American Gynæcological Society he gave his results, which are unequalled, according to his analysis, by those of any other method of treatment,—viz., in nearly four hundred cases, not a single death due to the operation. In forty out of sixty-three cases of cancer of the portio vaginalis (twenty-three patients having been lost sight of) the periods of exemption ranged from two to twenty-two years, the average period being over nine years. Of eighty-one cases involving the entire cervix, thirty-one patients were lost sight of, ten relapsed within two years, five had no recurrence for two years, eleven for three years, six for four years, eight for five years, six for seven years, two for eleven years, one for thirteen years, and one for seventeen years. Thus in fifty of this class whose histories could be followed up the average period of exemption was nearly six years.

Narcotics will invariably become necessary at some time during the course of the malady, but we should wait as long as the patients can bear the pain without their use, and should then begin with the smallest possible dose which will alleviate suffering.

With Dr. Byrne's consent, I describe his operations both palliative and radical, because of the remarkable immediate and remote results obtained by him, concerning which his statements are absolutely reliable.

After having removed all broken-down tissue by the use of a sharp curette, the cavity is sponged repeatedly with a mixture of commercial acetic acid, ʒi, glycerin, ʒiii, and carbolic acid, Ɔi; then the cavity is packed with absorbent cotton, which is allowed to remain for a few minutes or longer, as the case may be. On removing this, if bleeding is found to have ceased and the cavity is fairly dry, the cautery is applied. If, however, oozing of blood to any extent should still continue, it will be best to pass into the cavity a tampon saturated with the above styptic, allowing it to remain for forty-eight hours before the application of the cautery. Cauterization in all such cases should be conducted in the following manner :

The diseased organ should be exposed to view and the vagina protected by a Sims speculum and an anterior and two lateral retractors; it may be necessary to seize the edges of the excavation with one or more volsellæ. Before introducing the cautery electrode, a wad of absorbent cotton is to be passed into the cavity, held there for a moment, and as soon as it is withdrawn a dome-shaped electrode, brought to a cherry-red heat, is to be rapidly and repeatedly passed over the bottom of the cavity mainly. The surface is then again dried by wads of absorbent cotton held in dressing forceps, and cauterization is resumed as before. This process is to be repeated until the deeper parts of the cavity have become dry and charred, when the sides are to be treated in precisely the same manner and roasted to the same crisp condition. The seat of operation will now present the appearance of a perfectly black and dry cavity. All ragged and overlapping edges are next trimmed off by the cautery knife; a firmly-rolled tampon of suitable size, with silk thread attached, and saturated with the styptic compound, is then placed in the cavity, and finally a supporting vaginal tampon is applied and the patient removed to bed. The vaginal tampon may be removed on the following day, but the one in contact with the charred surface should be allowed to remain for forty-eight hours or longer. The subsequent treatment will consist of antiseptic vaginal douches, twice daily.

High Amputation.—In conditions admitting of high amputation, the following is the method usually resorted to. The uterus is to be exposed and the vaginal walls protected in the manner already described. The diverging volsella (Fig. 12), being passed well into the cervical canal, should now be expanded to a proper degree and locked, so as to afford complete control of the uterus during the entire operation.

By alternate traction and upward pressure on the uterus, an accurate idea should be obtained as to the proper point at which to begin the circular incision, so as to avoid injuring the bladder or opening into the cul-de-sac of Douglas. As to the latter, however, should it be found that the disease has involved the retro-uterine tissues, and that its excision or destruction by the cautery cannot be effected without opening the peritoneal cavity,

there need be no hesitation in doing this, as no harm is apt to result from it, whether done accidentally or by design. Should it be evident at the outset that the operation, in order to be thorough, must include a portion of the cul-de-sac, it will be better to make the line of incision anterior to this until the cervix has been removed, leaving the excision of the retro-uterine parts by the cautery knife as the final proceeding. Under these circumstances all that will be needed will be an antiseptic tampon properly applied.

In making the circular incision, the *cold* cautery knife (Fig. 12), slightly curved, should be applied close up to the vaginal junction, and, from the moment that the current is turned on, should be kept in contact

Fig. 12.
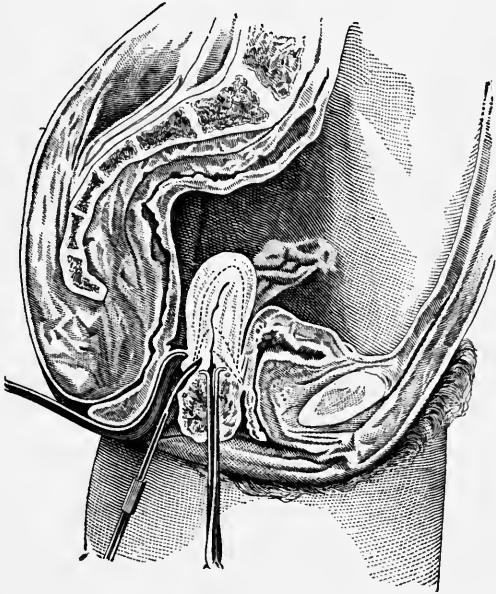
The carcinomatous cervix exposed by speculum, the uterus steadied with double diverging tenaculum, and the cautery knife applied. The lines show the course which the knife should take, according to the invasion of the neoplasm.

with the parts to be incised. Before removing the electrode for any purpose, such as change of position or altering the curve of the knife, the current should be stopped, and before continuing incision the instrument should be placed in position while cool. In other words, if the knife be heated before operation, even though to only a dull red, and applied to parts at all vascular, more or less hemorrhage will certainly follow; whereas if the cool platinum blade is already in contact with moisture as the current is being transformed into heat, vessels are shrunken or closed even before they are severed. This is a very important point, and should never be lost sight of in cautery operations.

The circular incision having been made to the depth of a quarter of an inch, it will now be observed that by increased traction the uterus may be

drawn much farther downward, and by directing the knife upward and inward the amputation may be carried to any desired extent. In cases calling for amputation above the os internum it will be better to excise and remove the cervix first, then, after dilating the canal sufficiently to admit the diverging volsella, to proceed as in the first instance, taking care, however, to keep within bounds. It will be found that the cupped stump can now be drawn down and made to project as a more or less convex body.

In all cases the dome-shaped electrode should be repeatedly passed over the entire cavity, so as to render the cauterization complete.

In carrying the knife towards the sides of the cervix, circular and other arterial branches are apt to be encountered, and hence, in this locality particularly, a high degree of heat in the platinum blade is to be carefully avoided. As an additional security against hemorrhage, the convexity of the knife should be pressed against the external surface of each particular section cut, so as to close vessels more effectually. The metallic parts of the electrode for the distance of about two inches should be covered with a strip of thin flannel, so that the vagina may be protected against injury from the reflected heat.

Injections of pyoktanin blue in inoperable cancer of the uterus have been given a very careful and thorough trial; I am unable to note a single instance of cure from the use of the remedy. The advantage to be gained, in my experience, is the prolongation of life, with a temporary improvement of the symptoms in most cases.

The pyoktanin should be in the form of a freshly-prepared solution (1 to 300), to be injected with a hypodermic syringe at several points in the infiltrated tissue, a few drops being used at each place of puncture, and in all about thirty minims being consumed. The dry powder is used in the interior of the uterus, or the entire surface may be brushed with a cotton swab dipped in a one-per-cent. solution. The injections should be made at intervals of from twenty-four to forty-eight hours. Thorough curettage should always precede the pyoktanin treatment.

We now come to the consideration of the radical treatment by means of the knife.

High amputation of the cervix for cancer, although promising in its results if the disease is limited to the vaginal portion, is not upheld by me, and will not be further discussed, first, because unquestionable cases of independent cancerous nodules in the body of the uterus have been observed; and, second, the operation, if properly performed, is just as difficult and nearly as serious as complete extirpation of the uterus. I hold that the entire uterus should be removed, even if the cervix is only slightly diseased, if the patient gives her consent to such a procedure. We shall therefore consider that operation only. If the organ is too large to be removed per vaginam, it should be extirpated by cœliotomy, as was proposed by Freund, of Strasburg, before vaginal hysterectomy came again into vogue.

The technique is similar to that used in total extirpation of the uterus in fibro-myoma, except that the necrosed tissue is first removed per vaginam with a curette, and the raw surface is touched with the actual cautery in order to avoid infection. Other methods—the sacral and the sacro-coccygeal—for removing the uterus for cancer are not acceptable to me, because a uterus in which the disease has progressed so far that it cannot be removed per vaginam, on account of malignant infiltration of the para-metria, should not be removed at all.

Fig. 13.
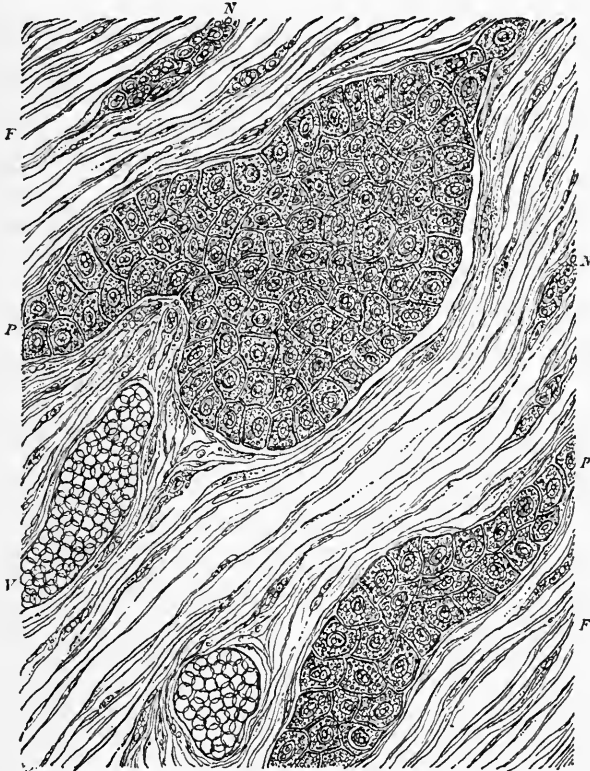
Scirrhus of body of uterus, × 500.—*P, P*, plugs composed of small epithelia; *F, F*, dense fibrous connective tissue between the plugs; *N, N*, nests of medullary corpuscles; *V*, blood-vessel filled with blood.

The frequent hemorrhages of greater or less degree, the fetid vaginal discharges, the pains of various character, the rectal and vesical tenesmus, the marasmic appearance of the patient, with impairment of the functions of the stomach, the indurated vagina, unyielding and hard to the touch, the ready breaking down of the cervix on manipulation, or of the already formed crater from the necrosed portion of the cervix, and the general indu-ration of the pelvis around the immovable uterus,—all these are character-istics of cancer of the cervix too far advanced for a radical operation.

Cancer of the corpus uteri starts invariably from the mucous lining.

It appears principally in two forms, the adenoid and the medullary. A great rarity is scirrhus of the body, of which I have seen one case. (Fig. 14.) All that I have said of the adenoid and the medullary form of disease of the cervix holds good for cancer of the body.

I may add that recent researches have established the fact that the so-called small-celled infiltration of the fibrous connective tissue (Virchow), termed inflammatory reaction by Waldeyer, must be considered as the formative stage of cancer. This fact is of great clinical importance. If, after removal of the uterus, the connective tissue at the cut surface, especially of the vagina, either in cervical or corporeal cancer, reveals under the microscope ever so little of such infiltration, we may be sure that the disease will recur. The same is true of the peritoneal cut surface in corporeal cancer.

FIG. 14.
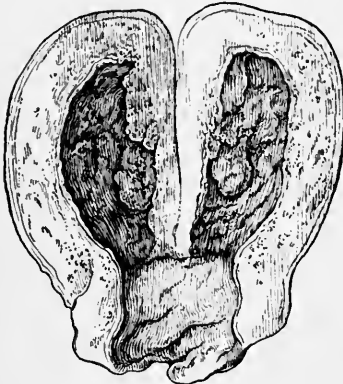
Scirrhous cancer of the corporeal endometrium.

The chief symptom in cancer of the uterine body is hemorrhage. I have stated that in carcinoma of the cervix bleeding is not apt to occur until the neoplasm begins to break down ; if the disease is situated in the body, we shall have, on the contrary, hemorrhage at a very early stage.

The amount of bleeding varies: in the case of patients who have not reached the menopause, it takes the form of menorrhagia in the beginning; later, however, the hemorrhages occur irregularly and continue for a varying period, from three or four days to as many weeks. I have seen several instances of acute anæmia due to continued bleeding in cancer of the uterine body.

The diagnosis cannot be made until the interior of the uterus has been explored and the suspected tissue has been examined microscopically. It is for this reason that in all cases of uterine hemorrhage in women more than thirty years old, in which the uterus is but little increased in size, curettage with a sharp instrument is indicated, after which the scrapings should be examined by a competent pathologist. If these show malignant disease beyond a doubt, there is but one course left to pursue. It is of great advantage to dilate the cervical canal and to explore the uterine cavity with the finger directly, to determine whether this is smooth, or whether a tumor or numerous papillary projections are present in the interior.

The question which must necessarily be of importance to all physicians is, What are the remote results of vaginal hysterectomy for cancer? No absolute percentage can be given ; it must necessarily depend upon two important factors : first, the time at which the diagnosis is made, and, second, the distance from the apparently diseased structures at which the operator works.
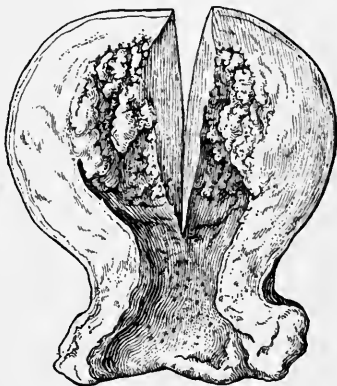
The earlier the diagnosis of malignant disease the better are the prospects of radical cure by operation. If the disease is in its early stages, before infiltration of the adjacent structures has taken place, we can

FIG. 15.
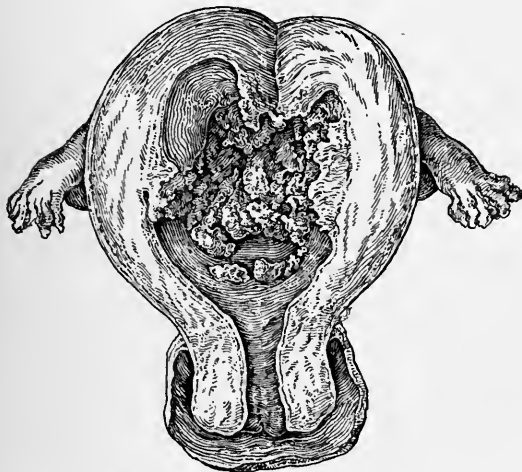
Medullary cancer of body of uterus.

FIG. 16.

Adenoid cancer of body of uterus, usually described under the misnomer "malignant adenoma."

probably count upon not less than fifty per cent. of permanent cures in the hands of expert operators,—*i.e.*, those who operate sufficiently far away from the diseased organ and take precautions not to produce infection during the operation.

Technique of Vaginal Hysterectomy. — The bowels are thoroughly emptied on the day prior to operation, and a warm bath is given. Before operation the mons and the external genitals are shaved, the abdomen, thighs, buttocks, external genitals, and vagina are vigorously scrubbed with ten-per-cent. creolin-mollin soap, then with a 1 to 1000 corrosive sublimate solution, after which the external genitals are washed with ether, subsequently with alcohol, and finally again with sublimate solution. The vagina is wiped out or thoroughly irrigated once more with a solution of corrosive sublimate (1 to 250), and then all is irrigated with plain water. The surroundings of the vulva are guarded with dry sterilized towels or with towels wrung out of a 1 to 1000 sublimate or a five-per-cent. carbolic acid solution, which are exchanged for clean ones when occasion

FIG. 17.

Edebohl's self-retaining speculum, used in vaginal hysterectomy, etc.

demands it.   The operator and assistants must disinfect themselves just as scrupulously.

The instruments required are sterilized by boiling in a two-per-cent.

sal-soda solution for ten minutes, and are then rinsed off with plain water two or three times, after which they are placed in plain warm water for use. After the operation has begun, plain water only is used. In cancer of the portio and cervix, such portions as readily break down are removed by scissors and the sharp curette, then volsella-forceps are used to pull the uterus down; but when there is no structure left which can be grasped by the volsella, as is not infrequently the case, the vagina surrounding the cervix is grasped anteriorly with one or two bullet-forceps half an inch or farther from the margin, and an incision is made as far away from the vagino-cervical border as is thought necessary; the mucosa is now stripped down and the bladder is peeled off for a short distance, when we can readily place a volsella. At this stage of the operation I prefer to open the cul-de-sac of Douglas, since with my index finger I can then better guide my needle in suturing the base of the broad ligaments. After opening the cul-de-sac the peritoneum is attached to the margin of the vagina by a continuous catgut suture. Sometimes I suture and ligate all around the cervix before cutting the vagina, but only when the uterus can be readily drawn down and is small, and a sufficiently large vagina is present. The operation then is practically bloodless, an important desideratum in a patient in poor physical condition. After placing a ligature, the tissues are cut; the uterus then gradually becomes more and more movable; if the parametria on one side are thickened, that is the side which ought to be liberated first. The base of the broad ligaments being · ligated and cut, we shall have no trouble in stripping off the bladder entirely, upward and outward, and then the peritoneum is at once secured to the anterior edge of the vagina by a continuous suture of No. 2 or No. 3 catgut. We now have a clear field in which to work. We place a ligature first on one

FIG. 18.

Vaginal hysterectomy, showing suturing of the base of the broad ligaments, the cul-de-sac having already been opened and the peritoneum attached to the vaginal mucosa with a continuous catgut suture.

side and then on the other, and cut; the uterus can be drawn lower and lower as we proceed. The needle is introduced near the margin of the vagina, and, guided by the left or the right index finger, as the case may be, secures as much of the broad ligament as is deemed proper; on emerging, it is again brought out in the vaginal margin, thus securing the stumps so that they are subsequently readily placed completely outside of the peritoneum. This also aids in preventing the ligatures from slipping off. If possible, I bring out the tubes and ovaries without first detaching them from the uterus. In cancer of the body the adnexa should always be removed, on account of the danger of carcinoma either being already present or developing subsequently. After having removed the uterus, which is done under almost constant irrigation, by means of a speculum constructed especially for such work by Fritsch, the iodoform gauze tampon or sponge, which I usually place within the peritoneal cavity after opening the cul-de-sac of Douglas, to prevent the intestines and omentum from prolapsing and hindering the work, is removed, and the pelvic cavity is irrigated with a stream of warm water. The stumps of the broad ligaments are now drawn down with bullet-forceps sufficiently to give a clear

Fig. 19.

Vaginal hysterectomy. The bladder has been separated from the cervix and the peritoneum, and the vaginal mucous membrane united with a continuous catgut suture. The external cervical opening is closed with a continuous silk suture at the beginning of the operation.

view and to bring them completely into the vagina, and a full-curved needle is introduced through them on either side, entering anteriorly through the vagino-peritoneal margin and emerging posteriorly in the same manner, and the ligature is tied. The opening in the vagina still remaining is closed with two or three sutures. All remaining ends of sutures are cut off, the vagina is irrigated with Thiersch's solution, and a small strip of iodoform gauze is introduced.

This is the best method, and patients so treated have been dismissed within ten days. It must, however, be frequently modified according to

the case, one of the most frequent variations being, if ligatures are used for the operation, to put a small strip of gauze in the vaginal slit still left, and to drain for twenty-four or forty-eight hours. This is done when peritoneal adhesions have been separated which give rise to oozing. Formerly I did not suture the peritoneum to the vaginal mucous membrane, neither was I particular about attaching my stumps in the vagina, yet my patients made good recoveries; but the convalescence was longer, and the procedure is obviously not so surgical, and necessarily, from a theoretical stand-point, is more dangerous. The gauze drainage in such cases was left from a week to ten days, and it was usual to see temperatures of 100° to 101° or 102° F. from the third to t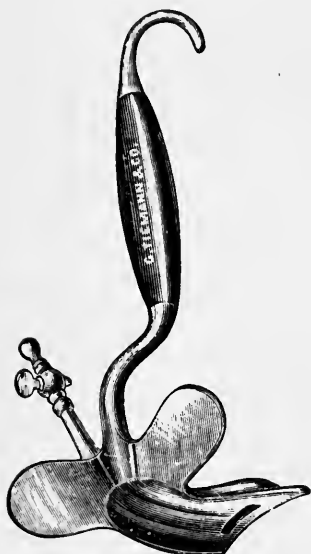he eighth or even as late as the fourteenth day,—a re-sorption fever. When it is easier to retro-flex the uterus or to anteflex it in order to secure the broad ligament, it should be done; this, however, is very seldom the case. Where the uterus is large and the vagina quite small, the latter may be dilated with a colpeurynter from two to three days before the intended operation, or a perineal incision may be made at the time of operation.

FIG. 20.

Continuous irrigation speculum.—Thumb-screw to regulate the amount of irrigating fluid, and attachment for tube of irrigator.

Catgut is used for sutures and ligatures throughout the operation. The best quality of gut is selected in the numbers desirable for use, which for heavy ligatures vary from Nos. 4 to 6, for plastic work from Nos. 2 to 4. For two weeks or longer it is placed in sulphuric ether and the jar is shaken daily once or twice; then it is removed and for a few hours (two or three) is wrapped in a dry, sterilized towel to allow the ether to evaporate. It is then placed in a watery solution of corrosive sublimate (1 to 1000) for eighteen or twenty-four hours, from which it is removed to a jar of absolute alcohol, in which it is boiled in a water-bath for several hours; the paper tied over the jar is pierced at several points with a needle, to prevent an explosion. Finally it is removed and placed in another jar of absolute alcohol. For an operation only about as much gut as will presumably be used should be taken out, and put into another smaller jar or dish of alcohol, in order to avoid unnecessary opening of the large jar.

In patients who have had attacks of parametritis and perimetritis, and in whom the broad ligaments have been thickened by the former inflammatory processes, the operation will be exceedingly difficult, since it is almost impossible to draw down the uterus; in such cases the incision is made anteriorly, and then the cul-de-sac of Douglas is opened, the posterior cut

is extended laterally, and the peritoneum, if it be convenient to do so at this stage of the operation, is attached to the margin of the vagina. Now the bladder is stripped from the cervix as far as can be conveniently done, and, guided by the finger, a clamp is placed on the base of the broad ligament the required distance from the cervix, and the parametria cut close to the inner border of the clamp; the same is done on the other side. It will now generally be found that the uterus can be drawn a little lower down, so that the bladder can be entirely separated from the cervix, when the remaining part of the broad ligament can be included in the next clamp applied, and then the rest of the broad ligament is cut. The same course is pursued on the other side, and any bleeding points which may still be found are secured by smaller hæmostatic forceps.

The handles of all forceps are securely tied with silk to prevent them from springing open subsequently, and the vagina is lightly packed with iodoform gauze, a strip of which is also wrapped around the forceps to prevent pressure on the soft parts. A heavy pad of absorbent cotton is secured

FIG. 21.
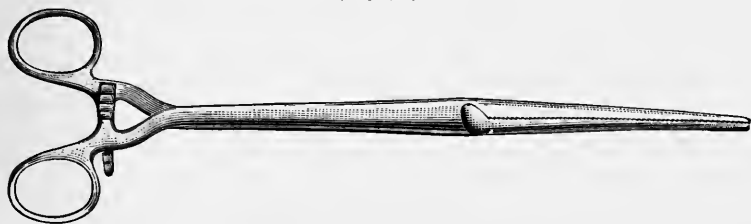
Clamp for vaginal hysterectomy.[1]

to the vulva by a T-bandage loosely applied. After the lapse of from twenty-four to thirty hours the clamps may all be removed without hesitation. To leave them longer would be injurious to the soft parts, and is entirely unnecessary. It has been argued against the use of hæmostatic forceps that when they are taken off the stumps of the broad ligament will retract and thus give rise to the danger of septic infection; also that along the handles of the instruments septic material may travel into the peritoneal cavity. However this may hold in theory, practice has disproved it. I have given this method a fair trial, and have not found a single instance to give cause for regret. It is positively a time-saving method; and not only so, but cases will be found operable when clamps are used in which ligatures cannot be employed. I refer to cases in which the parametria are very much thickened, because we can place clamps nearer the outer part of the broad ligament, if this is at all infiltrated, than it is possible to place a ligature. My only reasons for not using them always are, as previously

---

[1] The model of clamp here depicted has given me the best satisfaction of all varieties. Caution should be given to the maker that each instrument is first to be tried upon some material, such as a towel folded three or four times, to ascertain that the jaws grasp with equal firmness on both the distal and the proximal end.

stated, first, the convalescence is longer, and, secondly, I prefer from a surgical stand-point to leave a completely closed wound, because such patients after the operation are in as good condition as a woman after a normal confinement. It is the ideal operation, in my opinion. Unfortunately, however, we do not always have cases in which we are able to carry out this procedure. Another reason for preferring to close the peritoneal cavity entirely is that, in my opinion, there is less risk of ileus. Olshausen, of Berlin, treats the stumps of the broad ligaments intraperitoneally, and closes the peritoneum and vagina completely, but he admits, in his discussion before the Tenth International Medical Congress, that several patients so treated have had elevations of temperature and abscesses have formed and ruptured into the vagina.

One of the principal points in the technique of the operation, to prevent a recurrence of the disease, in cancer of the cervix, is to make the primary incision a considerable distance from the apparently diseased structures and to ligate the parametria as far from the uterus as possible. I have satisfied myself that in a certain number of cases of seeming recurrence it is not in reality a recurrence; the disease simply continues from some of the neoplasm left behind in the parametria, which may readily be overlooked. Other cases, of actual recurrence, take place through infection with carcinomatous material in healthy tissue. Examples of this are seen in the extensive parametric recurrences after operations for cancer of the portio, whether the operation has been supra-vaginal amputation or total extirpation. Such infection takes place during the operation. It is for this reason that, so far as my personal observation goes, the malignant disease of the uterine body and that developing in the cervical canal give a better prognosis in regard to recurrence than cancer of the vaginal portion, or that involving the cervix proper, because in the latter classes we come directly in contact with the disease during operation.

The difference between recurrence through infection and that due to diseased tissue left at the time of operation is, that in the former the manifestations are more general, the disease taking in a larger area in the parametria, whereas in the latter it is in the beginning more local and the general invasion takes place later. It is of great importance to understand the condition of the pelvic organs in a given case as thoroughly as possible before beginning the operation, and this can usually be learned only by examination under an anæsthetic.

We must determine the mobility of the uterus; if the parametria are infiltrated; if the disease has encroached upon the bladder or the rectum, and, if so, to what extent; if retro-uterine adhesions are present, and their nature: in short, we must decide whether the case is one still fit for operation, or, rather, whether we can make our incisions in non-malignant tissue. Up to within four years ago I held that we should always remove the carcinomatous uterus, if it was a surgical possibility, even should it prove necessary to operate in tissues already infiltrated by

carcinoma, believing (1) that the life of the patient would be prolonged; (2) that her sufferings would be diminished; (3) that, no uterus being present, we should have little or no bleeding and no disagreeable and ichorous discharge, and that, on the whole, the patient would at least be far more comfortable as long as she survived. This view is still held by a number of operators; but I have changed my opinion, and during the past two years I have seen enough patients to justify me in having done so. The patients, in the first place, do not live so long; secondly, they suffer excruciating pain; thirdly, there is fetid discharge and some hemorrhage,—indeed, occasionally quite profuse; fourthly, they are in no way more comfortable than they would have been if a total extirpation had not been done and the case had been treated on sound surgical principles, if as comfortable. To the second and third objections there are exceptions; I have myself seen them: hence the support I gave to the operation, even when the indications seemed doubtful. Some patients suffer intense pain in the pelvis, rectum, and bladder after recurrence and "continuous disease" after hysterectomy. By "continuous disease" I mean a continuation of the neoplasm when the operation is done in already diseased structures.

We now come to consider points in the diagnosis which serve to limit the operation from a clinical stand-point, premising that the terms upper and lower line of limitation for total extirpation for cancer should be discarded. There is only one line. Either the uterus can be entirely removed with a presumably good result—by operating in healthy tissue, so that we have no continuous invasion of the neoplasm—or we cannot remove it. No matter how recent the disease and how limited it may appear, the invariable rule, if the choice of the operation is given, should be to remove the organ completely; consequently, the lower line of limitation must be rejected.

1. Does a movable uterus always indicate operation?

2. Is hysterectomy contra-indicated because the parametria or the folds of the peritoneum posteriorly are thickened?

3. Does a fixed or an adherent uterus contra-indicate total extirpation?

4. Is total extirpation of the uterus contra-indicated when the disease is apparently limited to the cervix?

1. In answer to the first question, I would say that we can generally operate if the uterus is freely movable; but there may be a movable uterus because the broad ligament and the utero-rectal ligaments are not infiltrated, yet the disease may have involved the bladder to such a degree that a radical operation is out of the question. In such cases we gain much knowledge from the use of the sharp curette just before operation. We gouge out all the readily removable structure from the cervix, and if the disease has passed through the cervix into the cellular tissue between the bladder and the cervix, and into the former viscus, it is now readily discernible. It behooves us to explore the bladder with the finger, and so to determine the mobility of the vesical mucosa and muscularis against the

diseased part, which can be readily done per urethram after dilatation, the patient being thoroughly anæsthetized.   If we find that only a limited portion of its wall is involved, we can proceed, that being no contra-indication; we must simply be able to remove all of the diseased part without interfering with the ureters, and to close the defect completely at the time of operation, the same as in a vesico-vaginal fistula.   The same indication would hold good for moderate involvement of the rectum; it would be necessary to resect in the same manner as in cancer of that structure.   If, on the other hand, we find that the bladder or rectum is already involved to such an extent that we cannot entirely remove the disease, we are not justified in operating, no matter how movable the uterus may be: the sharp curette and the vesical and rectal examination have done their duty in clearing up the case.   Usually, of course, such invasions are marked by other signs of advanced disease, yet exceptions may occur.

2. A woman may have passed through one or more attacks of parametritis or perimetritis, or both, due to traumatism or incident to a puerperium, and, as a consequence, the uterus may have become more or less immovable, the broad ligament may be infiltrated, and the folds of Douglas in a like condition, and yet the operation be not only justifiable, but necessary.   Here the individual experience and judgment of the operator must decide whether such induration is inflammatory or carcinomatous.   The examination is best made with one or two fingers of one hand in the rectum and with the other hand on the abdomen.   We can thus feel and map out the pelvic contents, so as to determine the extent of the induration, and—a very important feature—whether it possesses elasticity; if it does, there exists an inflammatory infiltration.   Carcinomatous infiltrations have a peculiar resistance and are generally more bulky than inflammatory infiltrations.   Here the superiority of touch is on the side of the operator who has practised to any extent pelvic massage according to Brandt's method.   All this, of course, necessitates narcosis for the purpose of precision.

3. It is obvious that, although a cancerous uterus may be firmly fixed in the pelvis, its removal by means of vaginal hysterectomy is not contra-indicated, provided the adhesions fixing it are not infiltrated by the malignant neoplasm.

4. Inasmuch as vaginal hysterectomy involves but little more danger than high amputation of the cervix, and is obviously a more radical operation, it is always to be preferred, although the cancer is apparently limited to the cervix.

CHAPTER XIII.

NEOPLASMS OF THE OVARIES, TUBES, AND BROAD LIGAMENTS.

BY HENRY C. COE, M.D.

INTRODUCTORY.

THE importance which this subject has assumed during the past decade is due to the corresponding interest awakened in abdominal surgery, an interest which has steadily increased so as almost to overshadow minor surgical gynæcology. In this busy age it is impossible for the practitioner, when seeking information on a special subject, to review all that has been written : while it is important that he should possess a fair amount of theoretical knowledge, it is a well-recognized fact that the clinical side must always assume more importance to him than the pathological. For this reason the sections on pathology in this article are limited to the brief presentation of attested facts, mooted questions and discussions of theories being omitted.

While it is true that the successful abdominal surgeon, aside from his inherent qualifications, must have served a long and severe apprenticeship, it has been conclusively demonstrated that the occasional operator may obtain results which fully justify him in attempting operations which were once deemed unjustifiable for him. The writer does not believe that, in this country at least, abdominal work will, or should be, kept in the hands of a few men. Circumstances arise in which it is necessary for the general practitioner to perform ovariotomy : hence the importance of his possessing clear, well-defined ideas regarding indications and technique.

Every teacher of gynæcology must have arrived at the conclusion that the main thing which should be thoroughly mastered by the profession is the diagnosis of pelvic troubles. In most text-books this subject has been rendered too complicated by the introduction of many rules. Precision in diagnosis is the result of two factors,—the exercise of common sense and the cultivation of the *tactus eruditus*. The recognition of the presence of a pelvic or abdominal tumor, and of its probable nature and relations, at once implies the formation of a definite opinion as to the line of treatment advisable under the circumstances. The final decision concerning the performance of a radical operation may require counsel, but let the practitioner

at least learn to recognize that there *is* a tumor, at such a stage in its development as to be operable.

In order to gain a clear idea of the origin and mode of development of the neoplasms which will be considered in this chapter, the reader must refresh his memory in the anatomy of the broad ligament and the organs between its folds, especially the upper portion, known as the mesosalpinx. A study of Doran's diagram will suffice for pages of description indicating
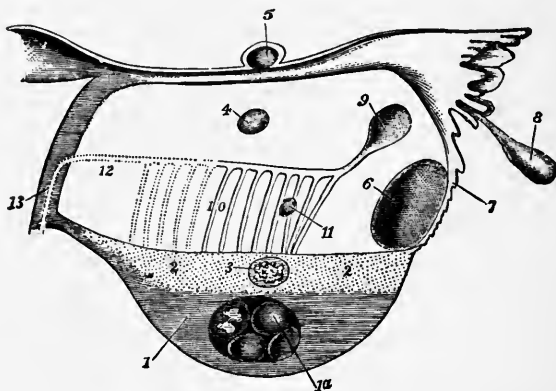
FIG. 1.

Diagram of the structures in and adjacent to the broad ligament, with tumors of the ovary, tube, and broad ligament.—1, Framework of parenchyma of ovary, the seat of (1a) simple or glandular multilocular cyst; 2, tissue of hilum, with (3) papillomatous cyst; 4, cyst of broad ligament, independent of parovarium and Fallopian tube; 5, similar cyst in broad ligament above the tube, but not connected with it; 6, similar cyst developed close to (7) ovarian fimbria of tube; 8, hydatid of Morgagni; 9, cyst developing from horizontal tube of parovarium (cysts 4, 5, 6, 8, and 9 always have a simple endothelial lining); 10, parovarium (the dotted lines represent the inner portion, always more or less obsolete in the adult); 11, small cyst developing from a vertical tube; cysts that have this origin, or that spring from the obsolete portion, have a lining of cubical or ciliated epithelium, and tend to develop papillomatous growths, as do cysts in (2) the tissue of the hilum; 12, duct of Gärtner, often persistent in the adult as a fibrous cord; 13, track of that duct in the uterine wall; unobliterated portions are, according to Coblenz, the origin of papillomatous cysts in the uterus.

the difference between ovarian and parovarian cysts, concerning which even some gynæcologists have vague notions. It is also necessary to review the minute anatomy of the ovary, and to recognize the fact that it consists of two distinct portions from which neoplasms may develop,—the oöphoron, or follicular zone, and the paroöphoron, otherwise known as the hilum. Bearing in mind, moreover, the fact that the ovary not only contains the tissues and cells found in both desmoid and epithelial growths, but is also the seat of many degenerative processes, some of which are not yet satisfactorily explained, it is not difficult to understand why it should be so frequently the point of origin of neoplasms, solid as well as cystic. The reader should study carefully every pelvic tumor removed by himself or others, and, if possible, submit it to a competent pathologist. Many operators of great experience fail to utilize their anatomical material, so that unique and valuable specimens are lost, or else are described so inaccurately that the reports possess no scientific value.

NEOPLASMS OF THE OVARY.

Several different classifications of ovarian tumors may be adopted, according as they are studied from a developmental, an anatomical, or a clinical stand-point. Clinically, they are distinguished as solid or cystic, and again as benign or malignant. The latter terms are used somewhat loosely, for the fact of malignancy cannot always be determined until after careful microscopical examination, and even then a cyst which is anatomically benign may be viewed with grave suspicion by reason of the accompanying conditions found at the operating-table.

OVARIAN CYSTS.

Pathology.—Cysts of the ovary are called *oöphoritic* or *paroöphoritic*, according to that portion of the gland in which they develop, and unilocular or multilocular, according as they contain one or many cavities. Dermoids, which clinically are included among cysts, form a peculiar class which it is customary to consider separately, at least as regards their pathology, though their close relation to ordinary cysts is shown by the not infrequent occurrence of a transition form,—so-called multilocular dermoids.

The subject of the origin of ovarian cystomata has long been the *bête noire* of students, who have been puzzled to reconcile the various theories that have been offered to account for the wide variations from simple follicular dropsy to the complex multilocular tumors containing various kinds of fluids and studded on their interior with numerous cystic and papillary outgrowths. So different do they appear that it seems impossible to refer them to a common origin. What the practitioner needs is a good working theory which will not only be clear in his own mind, but will have a direct relation to the questions of diagnosis and treatment. This will be obtained not by combining several theories, but by keeping steadily in mind the fact before mentioned of the division of the ovary into two distinct parts, one containing ovisacs, the other not. In one portion the cyst (whether simple or compound) has its origin in degenerative changes, occurring in the Graafian follicle, while in the hilum the mode of development is essentially different. When both portions take part in the process, the result is a neoplasm sharing the peculiarities of both seats of origin.

Oöphoritic Cysts.—(a) *Unilocular Cyst (Hydrops Folliculi; Follicular Cyst; Dropsy of the Graafian Follicle).*—These terms have been used so loosely that the reader often derives the impression that they are synonymous. The inference that every dropsical follicle may become a large cyst naturally carries with it the deduction that a cystic ovary is a source of positive danger and should be promptly extirpated,—one which is opposed to the principles of modern conservative surgery. The importance of the practical surgeon having a clear idea of this subject is at once apparent, since on his decision at the operating-table depends the preserva-

tion of an ovary after the removal of a neoplasm involving the opposite one.   There is no time then for pathological refinements.

Dropsy of the Graafian follicle is sufficiently explained by its name,—a simple dilatation of the ovisac with an accumulation of serous fluid.   These cysts, which are mostly peripheral, vary in size from that of a pea to that of an English walnut, and are often really unilocular, though even in such small cysts an examination of the wall will show traces of septa marking the presence of former loculi representing adjacent dilated ovisacs.   This wall is thin and transparent, being composed of fibrous tissue.   In a young cyst the lining may be the original membrana granulosa of the follicle, while the larger cysts have an inner layer of stratified epithelium, which may atrophy and disappear entirely in consequence of pressure. The contained fluid is a limpid serum, having a low specific gravity, and containing sodium chloride and a trace of albumin.   Unchanged ova have been found in cysts as large as cherries.

FIG. 2.

Unilocular cyst. (Museum of the College of Physicians and Surgeons.)

Dropsy of the follicle is essentially a retention cyst, due to a simple hyper-physiological process.   The true cause of the non-rupture of the ripe follicle is not always clear, Rindfleisch's theory of a " deficient bursting force" being rather vague.   A careful examination of the affected ovary usually justifies the inference that previous cirrhotic changes in the cortex or stroma have caused such thickening in the follicular wall as to prevent its rupture.   Degenerative changes in these small cysts are rare. Spontaneous or traumatic rupture (during examination) probably occurs with considerable frequency and with harmless results ; in fact, it may lead to a cure.

True unilocular cysts of a size sufficient to assume surgical importance rarely originate in the oöphoron, so that when an operator encounters a tumor which seems to be oligocystic he is usually safe in inferring that it is either parovarian or was originally multilocular.

(b) *Multilocular Cysts of the Oöphoron.*—Without desiring to involve the reader in a discussion of the various pathological theories which have been advanced to account for the protean forms observed in ovarian cysts, it is only proper to state that weighty authorities refuse to accept the explanation which commends itself by its simplicity and clearness,—*i.e.*, that multilocular cysts develop by the simultaneous distention and coalescence

of contiguous dropsical follicles, as illustrated by Tait's familiar simile of the group of soap-bubbles. The transition from cystic degeneration of the ovary to the enormous neoplasm which fills the entire abdomen seems too great to be bridged over so easily. Yet it does not seem forced to refer all multilocular cysts to a common origin,—the non-developed or degenerated follicle,—assuming that in the simpler form the follicle alone shares in the process, while in the glandular and proliferating forms there is accompanying activity of the glandular and connective-tissue elements.

To begin with the simplest variety of multilocular cysts. Whether these are originally of inflammatory origin or the contrary does not especially concern us, though they probably do represent the result of a previous so-called general "cystic oöphoritis," and not a simple hydrops folliculi, the distinction between which has already been pointed out. In its incipiency such a tumor would be represented simply by an agglomeration of small grape-like cysts forming a mass the size of an orange. These grow, some rapidly and some more slowly, until they reach the size of the adult head (which they seldom exceed), and various internal changes occur which,
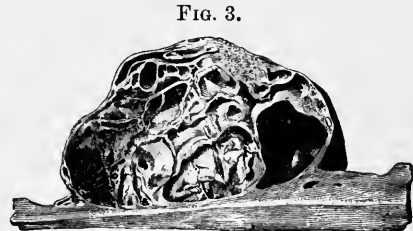
Fig. 3.

Multilocular cyst, incipient stage.   (Museum of the College of Physicians and Surgeons.)

it should be remembered, are purely mechanical. There is no proliferation of epithelium or formation of new cysts, in which they differ from true cysto-adenomata. On section they present a characteristic honey-comb appearance, contiguous cysts being separated by their respective walls, which become thinned by increasing pressure and eventually give way, throwing two loculi into one. Localized thickenings, general hypertrophy of the cyst-wall, etc., occur, though rarely the degenerative changes seen in the larger neoplasms. The fluid preserves its original serous character, with the occasional admixture of blood, débris, etc. The simple epithelial lining previously described is preserved in the smaller cysts, but disappears in the older ones.

Passing to the more complex variety of multilocular cysts, we are given the choice of two theories,—either to regard them as identical in their mode of development with the simpler form already described, or as originating in a more complex manner, according to the various theories of Waldeyer, Pflüger, et al. The reader will find the former to be preferable from a clinical stand-point, and, indeed, it has the sanction of some of the best pathologists, notably of Sutton. The latter distinguishes multilocular oöphoritic cysts as simple and adenoid, with a third variety, multilocular dermoids, which will be described later. The adenoid feature, which many have found such difficulty in explaining, is referred by him to simple proliferation of the original lining epithelium of the cyst. In a similar manner, with the additional element of connective-tissue hypertrophy, may

40

be explained the presence of the dendritic or papillomatous masses which spring from its inner wall. The commonest form of cyst is the so-called "proliferous glandular," characterized, as its name implies, by the development of secondary glandular outgrowths from the walls of the larger cysts (which are simply retention-cysts), which may increase in size and coalesce so as to fill the cavity of the parent cyst; or the newly formed follicles may not dilate, and, being surrounded by a dense stroma, may present the appearance of solid growths. On section of such a cyst, the relation of the primary and secondary loculi to the parent cysts will be at once apparent, as well as the mode of formation of larger cavities through the coalescence of adjacent loculi. If the connective tissue of the cyst-wall undergoes proliferation, there result vegetations or cauliflower growths, which project into and may fill the cyst-cavity; when these predominate, the growth is characterized as a "proliferous papillary cyst." Both glandular and papillary formations may coexist in the same cyst.

FIG. 4.
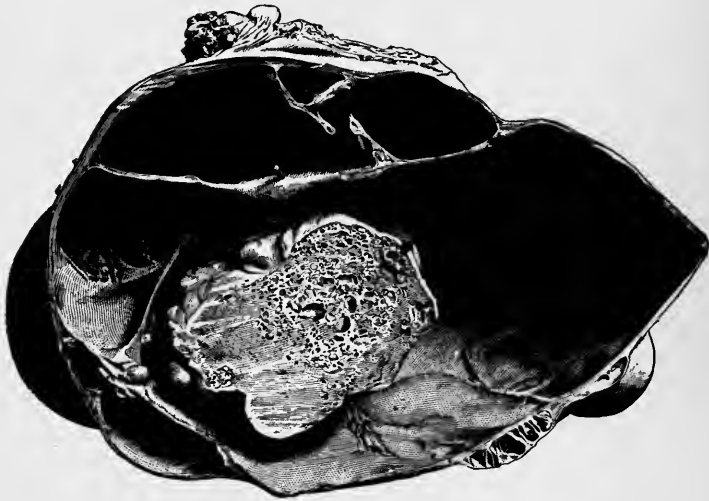
Small multilocular cyst. (Museum of the College of Physicians and Surgeons.)

The exterior of a multilocular cyst which has not undergone marked degenerative changes presents a characteristic smooth, glistening appearance, its color being uniformly whitish, except at spots where the wall is quite thin or has undergone inflammatory or necrotic changes, where it may show grayish-green or brown spots. It varies in thickness according to the age of the cyst, the amount of distention, and the presence of localized hypertrophy, adhesions, etc. Some hint as to the character of its contents may be obtained from its external appearance. As Doran observes, "the smoother and shinier and the more silvery the cyst-wall appears when exposed by abdominal incision, the better the case will be both for the patient and for the operator."

The wall of the main cyst, especially in the vicinity of the pedicle, can usually be separated into three layers, though if it has become much thinned the middle coat may disappear entirely, the outer and the inner being then fused together. The outer surface is covered with a layer of endothelial cells. Cubical epithelium has been found on the surface of small growths. The middle coat is composed of white fibrous tissue, containing smooth muscular fibres which seem to be derived from the ovarian ligaments. The blood-vessels supplying the tissues are found in this layer, as well as large lymphatics, especially in the neighborhood of the pedicle. Nerves have been traced to the cyst-wall, but their ultimate terminations have not been made out. As before stated, ovarian tissue may sometimes be found even in cysts of considerable size, especially the remains of the hilum. The writer has seen a corpus luteum in the wall of a large cyst, showing that ovulation still persisted. This would explain those cases in which pregnancy has occurred with double ovarian tumors. The

FIG. 5.
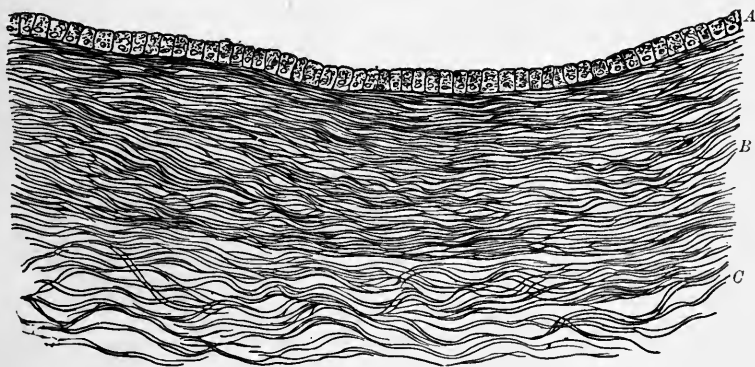
Section through the wall of a simple ovarian cyst. (Olshausen.)—*A*, epithelial lining; *B*, dense fibrous layer; *C*, loose fibrous layer.

smaller secondary cysts are lined with a single layer of columnar epithelium, which in the larger cysts becomes flattened by pressure, so as to assume an endothelial appearance; the cells eventually atrophy or undergo fatty degeneration, desquamate, and disappear entirely. Changes in the color, thickness, and consistency of the inner wall of the cyst represent various inflammatory and degenerative changes. Acute inflammation may terminate in actual suppuration, necrosis, or gangrene, with perforation of the wall, while chronic inflammation may result in localized thickening, deposits of lime salts, etc. Changes in the walls of blood-vessels lead to thrombosis, ecchymoses (either punctate or extensive), or actual rupture of vessels, with more or less profuse hemorrhage into the cyst. The cyst-fluids váry greatly in their physical characteristics, specimens of entirely different color and consistence being often obtained from the different loculi of the same cyst. The main cyst may contain a thick chocolate-colored fluid, one of the secondary cysts a transparent jelly, another a thin limpid secretion,

while others may be greenish, milky, or (in the case of a dermoid) thick and pultaceous. These modifications in color are due to admixture of blood, pus, fat, epithelial cells, cholesterin, etc. The original fluid consists of two portions,—one a simple transudate from the blood, the other due to a change in the protoplasm of the epithelial cells. Its specific gravity varies from 1010 to 1050; it usually has a neutral or an alkaline reaction. Spontaneous coagulation does not occur unless it contains a considerable amount of blood, a peculiarity which distinguishes it from ascitic fluid. It contains albuminoids, fats, and salts; cholesterin is often present; mucin and albumin are very frequent; paralbumin is a constant component, being precipitated in fine flocculi on passing carbonic acid gas through the fluid. It was formerly considered pathognomonic of ovarian cyst-fluid, an error which was pointed out long ago.

FIG. 6.
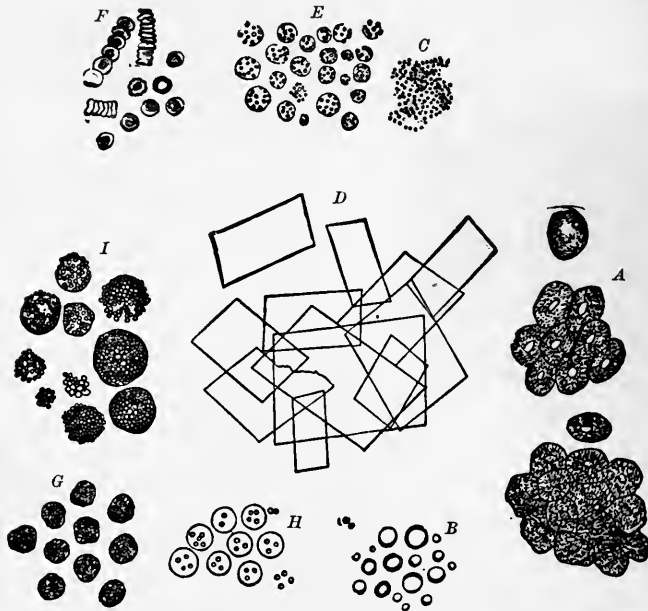
Microscopical appearance of ovarian fluid. (Drysdale.)—*A*, epithelial cells; *B*, oil-globules; *C*, free granular matter; *D*, crystals of cholesterin; *E*, granular cells; *F*, blood-corpuscles; *G*, *H*, pus-corpuscles; *I*, inflammatory globules of Gluge.

Much stress was once placed upon the importance of examining cyst-contents with the microscope. The formed elements observed are blood- and pus-corpuscles, fatty globules, cholesterin-plates, and epithelial cells in various stages of degeneration. The so-called "ovarian granular cell" which Drysdale regarded as peculiar to ovarian cyst-fluids is not pathognomonic, since it may be found wherever epithelial cells are undergoing fatty degeneration. As a matter of fact, however, the presence of numbers of these bodies in fluid withdrawn from an abdominal tumor would possess some diagnostic value, though their absence would not. Some hint as to

the presence of degenerative changes in the cyst-wall might be derived from a careful examination of the fluid withdrawn through an aspirating-needle. There is also room for considerable bacteriological work in this direction, in order to throw more light upon the septic character of fluids which macroscopically appear innocent, while others which present a suspicious appearance cause no irritation when they escape into the peritoneal cavity.

(c) *Cysts of the Paroöphoron; Papillomatous Cysts.*—Doran refers all papillomatous cysts to the hilum of the ovary, explaining the presence of papillary growths in oöphoritic glandular cysts by the presence of remnants of the epithelium of the Wolffian body in the stroma of the parenchyma. Sutton does not go quite so far as this, but believes that the majority of papillomatous cysts spring from the paroöphoron. Williams, on the contrary, thinks that they are derived either from the germinal epithelium or from the Graafian follicle,—a view which harmonizes with the

Fig. 7.
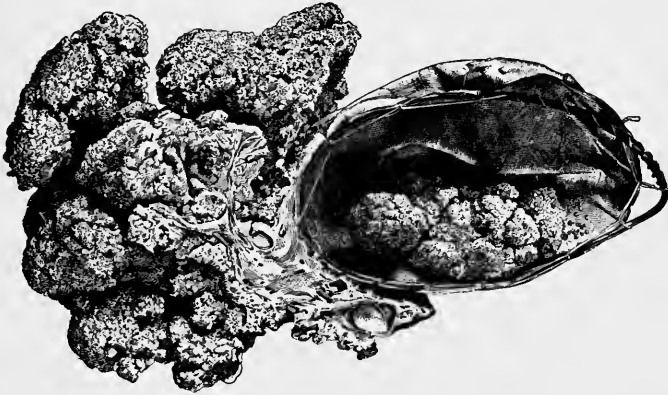
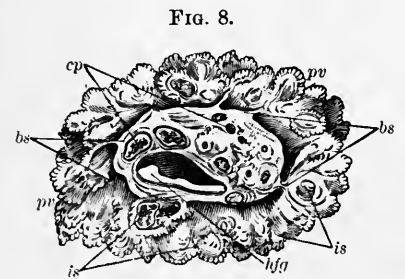Papillomatous ovarian cyst. (Museum of the College of Physicians and Surgeons.)

theory already proposed, that all ovarian cysts are of follicular origin. The two former observers hold that papillary cysts developing from the hilum tend to invade the broad ligament, as distinguished from those originating in the parenchyma, which leave it intact. Without entering further into the discussion of their mode of origin, it is sufficient to say that these cysts seldom attain a large size as compared with the glandular variety, and present a similar appearance externally, except when the papillary growths have perforated the cyst-wall. On section they are seen to be filled with dendritic masses, varying in size from that of a millet-seed to that of the fist, and either sessile or having long, slender pedicles. According to their vascularity, they may present a whitish or a reddish color. They are soft and friable, sometimes having a gritty feel from the presence of psammomatous bodies. They proliferate rapidly, often causing rupture of the cyst, when they spread over its outer surface and to the adjacent peritoneum. The fluid, unlike that contained in glandular cysts, is usually clear and

watery, but has about the same chemical and microscopical characteristics, though mucin is rarely found. Microscopically the cyst-wall is seen to consist of the usual fibro-muscular layers and an inner cylindrical epithelial lining, which is continued over the papillary outgrowths, sometimes being ciliated. The latter are formed by prolongations of the stroma, which has become looser and more myxomatous and is highly vascular. Many calcareous bodies (psammomata) are found throughout the stroma and on the surface of the papillary masses.

The tendency of these tumors to undergo cancerous degeneration is well known, though so sweeping a statement as that of Wells, that they are all malignant, is, of course, based on clinical rather than on anatomical observations. The cancerous change may be limited to small portions of the cyst, discoverable only on careful microscopical examination, or it may involve the entire growth and be accompanied by metastases in distant organs. The question of metastasis in connection with simple non-malignant papillomatous cysts is an interesting one, and is of great importance surgically. By metastasis we understand not the direct extension of the growths to adjacent organs (the bladder, rectum, or uterine cavity) after perforation of the cyst, but the development of independent secondary growths on the peritoneum, with accompanying ascites. These are produced by the implantation of fragments of the original growth which are detached, float about in the peritoneal fluid, and lodge at various points, where they become fixed and undergo an independent growth. Cases of true metastasis in the lungs have been reported, emboli being carried by the vessels in the usual manner.

FIG. 8.

Section of papillomatous ovary. (Coblenz.) —*hfg*, dropsical Graafian follicle; *cp*, cysts filled with papillary vegetations; *bs*, pedicle; *is*, interpapillary spaces; *pv*, superficial papillary vegetations.

As regards their frequency of occurrence, papillomatous cysts are now known to be more common than was usually supposed, their proportion to the glandular being about one to ten.

Closely related to these cysts is the interesting condition known as superficial papilloma of the ovary, or clinically "warty" ovary. This is quite rare, many gynæcologists with a large experience in abdominal surgery never having encountered a case. In a typical specimen the ovary is enlarged to the size of a walnut or a goose-egg, its exterior being studded with cauliflower growths identical in appearance with those found in papillomatous cysts, which may appear as minute sessile warts or large, friable, pedunculated masses. Although the ovary itself may be little changed, it is sometimes so covered with the neoplasm as to be apparently transformed into the same. Section of a warty ovary shows that the growth is entirely superficial, the stroma being often unchanged or presenting merely the

ordinary appearances of fibrous hyperplasia.   Microscopically the papillary masses are identical with those already described; they are vascular connective - tissue outgrowths, covered with a single layer of cylindrical epithelium, often ciliated, which, as Williams has shown, is continuous with the germinal epithelium of the ovary, processes of which can be traced down into the stroma. This simple and satisfactory explanation serves to clear up a good deal of the mystery which has been attached to these peculiar neoplasms.   From their position on the surface of the ovary it will naturally be inferred that they tend, even more than do papillomatous cysts, to form secondary deposits in adjacent organs and on the peritoneum, and are equally prone to malignant degeneration.

FIG. 9.

Papilloma of ovary.   (Cleveland.)

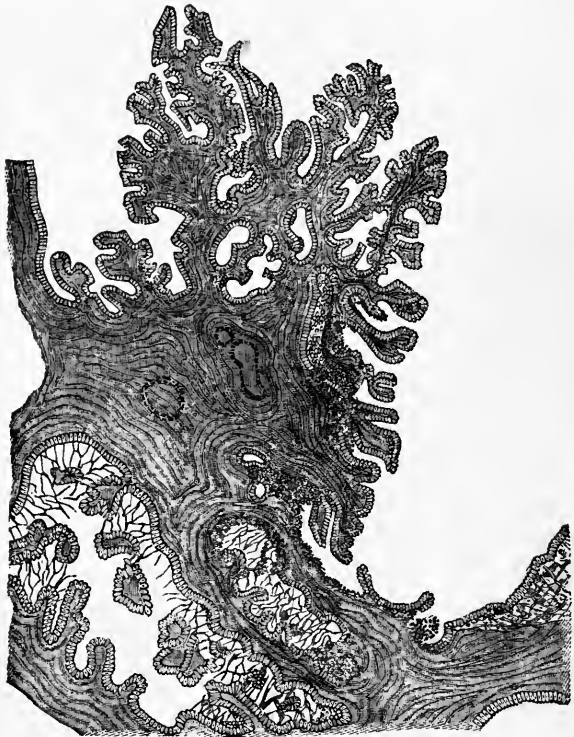The occurrence of ascites in connection with the cystic and solid growths

FIG. 10.
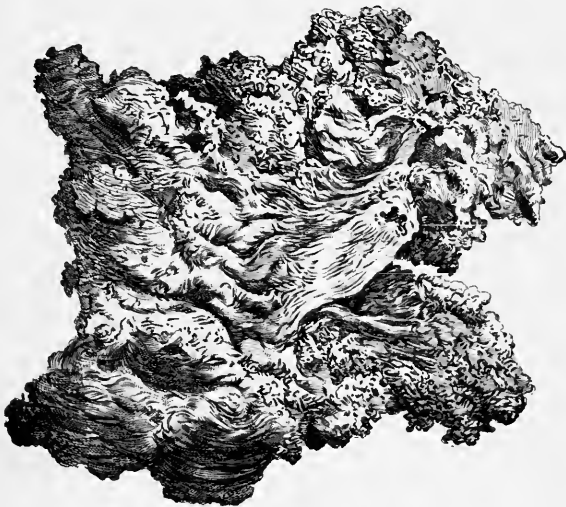
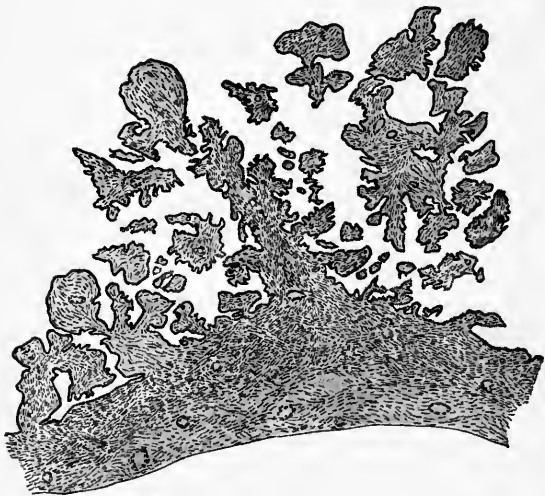Papilloma of ovary.   (Williams.)

above described is so common as to deserve mention in connection with their pathology.   Its clinical significance will be considered in another

FIG. 11.

Interior of papillomatous cyst.   (Williams.)

FIG. 12.

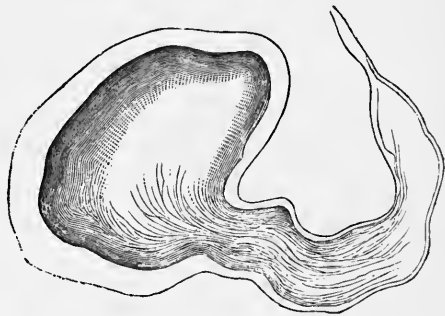Section through wall of papillomatous cyst.   (Williams.)

place.   Although ascites may develop without rupture of the cyst, it is usually to be regarded as an evidence of general peritoneal irritation, due to metastatic deposits, rather than as a transudation from the growths themselves.   Viewed in this light, it of course offers no reliable clinical evidence of the malignancy of a neoplasm.   Hydrothorax has been noted in some cases, though not due to metastasis in the pleura.   As Freund remarks, this is not necessarily a contra-indication to operative interference.

TUBO-OVARIAN CYSTS.

The term "ovarian hydrocele" was formerly used as synonymous with tubo-ovarian cysts.   Sutton has pointed out that there is an essential anatomical difference.   A tubo-ovarian cyst consists of a simultaneous dilatation of the ovary and of the Fallopian tube, which have become adherent; whereas ovarian hydrocele is formed by a collection of fluid within the fold of peritoneum which sometimes surrounds the ovary.   The latter is distinguished anatomically from tubo-ovarian cyst by the fact that the tube opens into a sac on the posterior fold of the broad ligament, that there is no evidence of inflammation, and that the ovary is found projecting through the wall of the sac.   The contents of a hydrocele may occasionally escape through the tube into the uterus,—the so-called "intermitting ovarian hydrocele."

Various theories have been advanced to account for the development of tubo-ovarian cysts, the most plausible of which seems to

FIG. 13.

Tubo-ovarian cyst.   (Olshausen.)

be that it begins as a catarrh of the tube, the fimbriated extremity becoming attached to the ovary at the site of a Graafian follicle, that the tube and the ovary enlarge simultaneously, and that the septum between the two cavities subsequently gives way.   But, since this combination may occur in connection with large multilocular cysts (and even with those of the broad ligament), it seems fair to infer that there may be previous formation of the cyst before the diseased tube becomes adherent to it.   Such cysts present a characteristic shape, there being a gradual dilatation of the tube from its proximal extremity outward, the elongated cyst ending in a large bulbous extremity.   They are generally of small size, but may contain two or three pints of fluid.   The disease is usually unilateral.   According to the length of time during which it has existed, the line of demarcation between the tube and the cyst becomes less and less distinct, until the fimbriæ disappear entirely.   The outer surface of the cyst is covered by peritoneum, and its wall consists largely of smooth muscular fibres which

become much thinned through distention. It is lined with a layer of columnar ciliated epithelium, but the cilia soon disappear. It contains serous fluid with few cellular elements, which, in consequence of hemorrhage, may assume a chocolate color. It is not possible to recognize positively such a growth before operation; it is most apt to be confounded with hydrosalpinx, nor is the diagnosis always clear till the specimen has been carefully examined by a pathologist.

<div align="center">EXTRA-PERITONEAL CYSTS.</div>

A peculiar form of cyst described by Tait,[1] which develops from the patent urachus, is clinically indistinguishable from an ovarian or a parovarian cyst. Although cysts of this form are rare, the surgeon should bear in mind their existence, in order that he may not be confused by the peculiar relations of the tumor noted on opening the abdominal cavity. They develop outside of the peritoneum, and, lifting up the peritoneum first over the anterior abdominal wall, may then dip down into the pelvis and make their way upward along the spine. These growths are usually small, but Tait mentions one which contained a gallon of fluid. They sometimes communicate with the bladder, and they have been known to rupture at the umbilicus. They grow rapidly, and may often undergo suppuration, leading to hectic fever and other symptoms of sepsis.

The diagnosis is difficult, and the surgical treatment far from easy. Since they have no pedicle, it is necessary to enucleate them, and, as the peritoneum must be stripped off over a wide surface, there is great danger of subsequent necrosis of this membrane.

<div align="center">DERMOID CYSTS.</div>

It is hardly necessary to call the reader's attention to the various theories which have been presented to explain their origin, notably that of inclusion of the epiblast. The theory of Johnstone is not only the simplest, but is in perfect harmony with that already suggested to account for the origin of ordinary cystomata,—i.e., that they originate from the Graafian follicle, through a faulty development of the ovum itself, which contains the germ of all varieties of tissue; hence tissues and organs are found in dermoid cysts which spring not from the epiblast alone, but from the mesoblast and the hypoblast as well. This suggestive theory seems to explain satisfactorily the occurrence of dermoid elements in ordinary multilocular cysts.

Dermoids may be classified for convenience as pure dermoids and unilocular or multilocular cysts with dermoid loculi. Dermoids constitute about five per cent. of all ovarian tumors, and may be found in patients of every age, from the new-born child to the woman of eighty, though they are most common during the period of functional activity. The majority of ovarian cysts in children are of the dermoid variety. Both ovaries are

---

[1] British Medical Journal, November, 1886.

affected in about one-fourth of the cases.   They seldom exceed in size a man's head, differing from ordinary cystomata not only in their slow
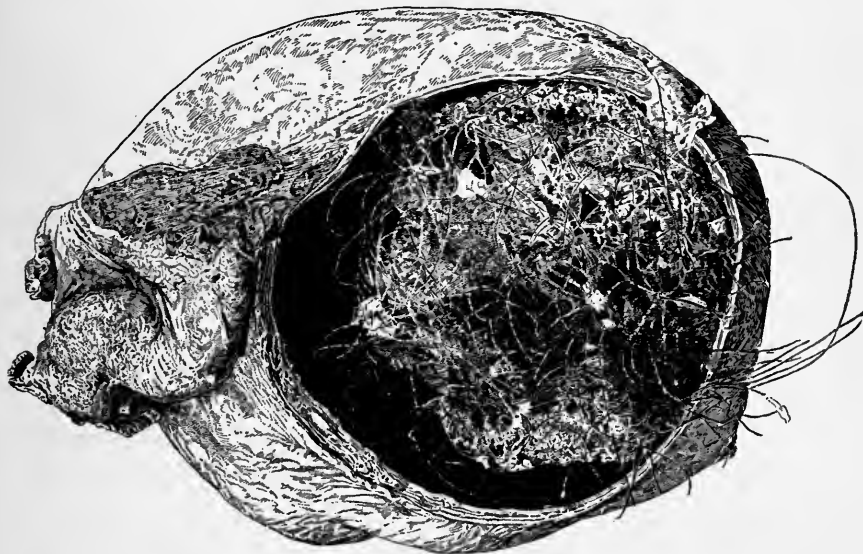
Fig. 14.
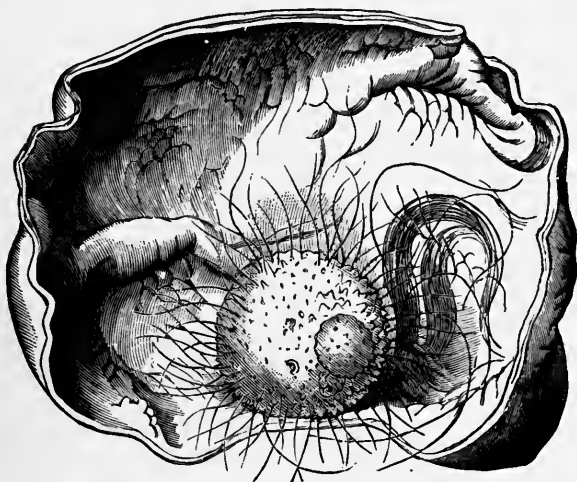
Ovarian dermoid, containing pseudo-mamma.   (Sutton.)

growth, but also in the fact that after reaching a certain size they may remain stationary for years, although prone to undergo degenerative changes and to contract adhesions to adjacent organs.

Fig. 15.

Dermoid cyst.   (Museum of the College of Physicians and Surgeons.)

Macroscopically a dermoid presents a decided contrast to an ordinary multilocular cyst, having a dull appearance and a darker color (instead of

being white and glistening), with yellowish patches where the caseous contents are seen through the thinned wall. The wall is usually thicker than in an ordinary cyst, and is lined with a layer of tissue, either smooth or thrown into folds or projections, presenting the appearance of skin. Dermoids nearly always contain hair, which may spring from the inner surface singly or in tufts, or may be rolled into balls. This hair is usually of a coarse texture, and either light or dark, its color bearing no relation to that of the patient's hair. Sections through elevated patches on the cyst-wall show that they contain several layers, the inner consisting of several strata of epithelial cells, the superficial being flattened and non-nucleated,

Fig. 16.
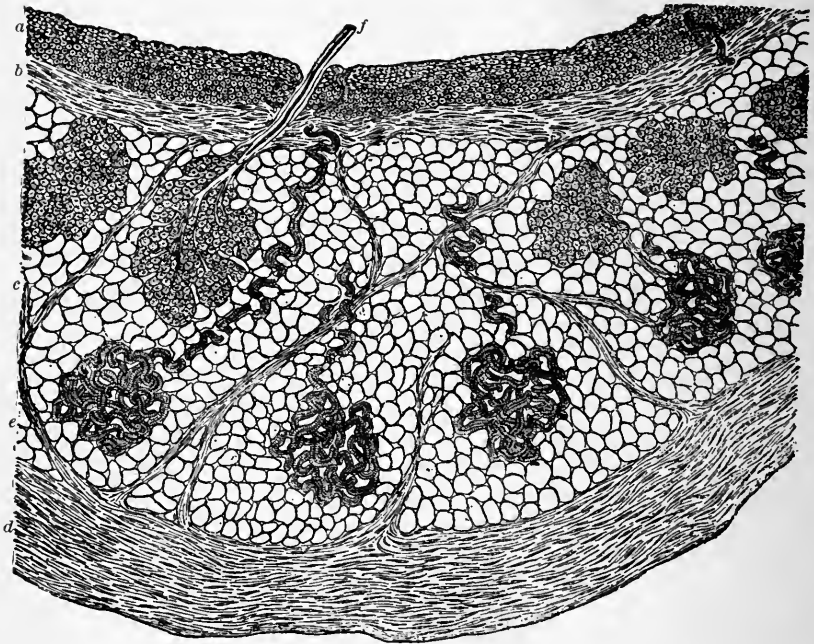
Section through the wall of a dermoid cyst, showing—*a*, flattened epithelial cells; *b*, deep layer of connective tissue; *c*, loose adipose tissue; *d*, superficial connective-tissue layer; *e*, sweat-gland; *f*, hair follicle and sebaceous gland. (Wyder.)

the deeper layers polyhedral. Below these is a layer of connective tissue corresponding to the corium, and more externally the panniculus adiposus. In addition to hairs, which show the same microscopical structure as in true skin, normal sweat and sebaceous glands are seen, though these, as well as the hair, may atrophy and disappear.

Various other structures are frequently found in dermoids, bone and teeth being most common, though cartilage and nervous and muscular tissue may be present, and even well-formed organs, especially mammæ. Bone occurs either in the form of thin laminæ embedded in the connective tissue of the cyst-wall or in various bizarre shapes, resembling rudimentary

cranial bones, alveolar processes, etc. Microscopically, these present the ordinary structure of bone. Teeth are of quite common occurrence, and may vary in number from two or three to several hundred, the usual number being ten or twelve.

The contents of dermoid cysts vary in consistence from an oily liquid to a thick caseous mass (after exposure to the air), its peculiar appearance being due to the substances of which it is composed,—*i.e.*, the secretion of the sebaceous glands mixed with epithelial débris and cholesterin in which are mingled masses of hair. In a few instances the caseous material has been found arranged in the form of spheres, which on section showed fat deposited in concentric layers. This phenomenen has been ascribed to axial rotation of the cyst. The contents of a dermoid seldom exceed three or four pints. The presence of blood may change the color from the ordinary white or dirty gray to brown or chocolate.

Tumors of this variety, though anatomically benign, are to be viewed with suspicion, since cases have been reported in which they have undergone sarcomatous degeneration. Moreover, the development of malignant disease within the pelvis has been observed after the removal of dermoids. Peritoneal metastases have several times been noticed, developing in the same manner as in connection with papillomatous cysts. It is not certain whether these are due to bursting of the cyst or are examples of true metastasis. The secondary masses present a structure similar to that of the parent cyst, containing the same caseous material, but hair has been found in them in only a single instance.

It should be noted that true dermoid cysts are invariably unilocular, the formation of secondary cysts by proliferation never occurring. If, as rarely happens, separate loculi are found, their presence is to be explained rather by the coalescence of separate adjacent cysts (three or four of which may develop independently in the same ovary) than by the actual growth of septa within a unilocular cyst, as Tait suggests. So - called multilocular dermoids (Fig. 17) are not, as the name would seem to imply, pure dermoids
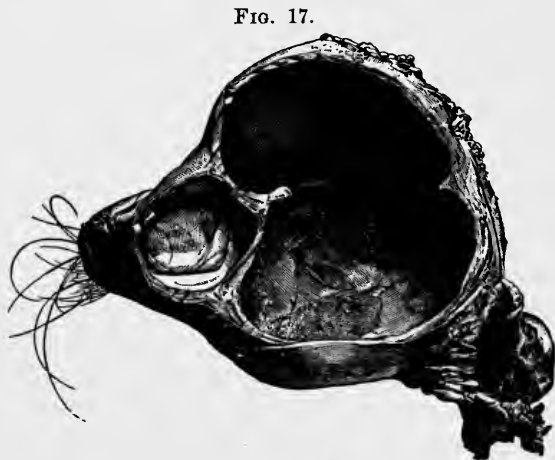

Fig. 17.

Small multilocular dermoid cyst. (Museum of the College of Physicians and Surgeons.)

containing several compartments, but are ordinary proliferating cysts, one or more loculi of which present the ordinary structure of a dermoid, as

regards the presence of skin, hair, bone, etc. These growths, which are not uncommon, possess considerable interest for the surgeon as well as for the pathologist, since the presence of the dermoid element may modify the prognosis of an otherwise simple neoplasm by introducing certain complications (peritonitis, suppuration, perforation, etc.) peculiar to the latter class of tumors.

The Pedicle.—In order to understand the formation of this structure the reader must familiarize himself with the normal relations of the ovary to the Fallopian tube and mesovarium. According as a tumor arises from the parenchyma or from the hilum, it will tend to grow upward into the abdominal cavity or between the folds of the broad ligament; in other words, its development will be respectively intra-peritoneal or extra-peritoneal. Under the former conditions the cyst will be pedunculated, under the latter sessile or non-pedunculated. In the case of certain small tumors which are not intra-ligamentous there may be no true pedicle, the growth being sessile and attached by the mesovarium alone. The typical pedicle contains the mesovarium with the ovarian and the tubo-ovarian ligaments and the Fallopian tube. The round ligament is not properly included, and is not usually ligated at the time of operation.

Pedicles vary greatly in size, some being long and slender, others broad, thick, and fleshy, the difference being due to atrophy or to hypertrophy of the existing structures, not to any change in their number, since they are quite constant. There is no constant relation between the size of the cyst and the character of the pedicle, except that in the case of small movable tumors (especially the solid variety) it is apt to be long and slender. As the cyst continues to enlarge and the mesosalpinx is stretched, the outer end of the tube approaches it until it lies in direct contact with the growth. There is no feature in the anatomy of the pedicle so important from a surgical stand-point as the distribution of the vessels. The arteries are branches from the uterine as well as from the ovarian. Those from the latter enter the pedicle from the outer side, the uterine branches from the inner extremity. The veins which are derived from the pampiniform plexus are sometimes enormously dilated, so that the central portion of the pedicle may have an appearance resembling that of varicocele. Both arteries and veins may present a formidable appearance by reason of their size, it being not uncommon to see an artery as large as the radial in the stump. Connective tissue and smooth muscular fibres are naturally found in the pedicle, and nerves and lymphatics may be traced along it to the cyst, though their ultimate distribution in the latter has not been positively made out.

SOLID TUMORS OF THE OVARY.

These are of infrequent occurrence as compared with cystomata, forming about five per cent. of the whole number of ovarian neoplasms. The benig-
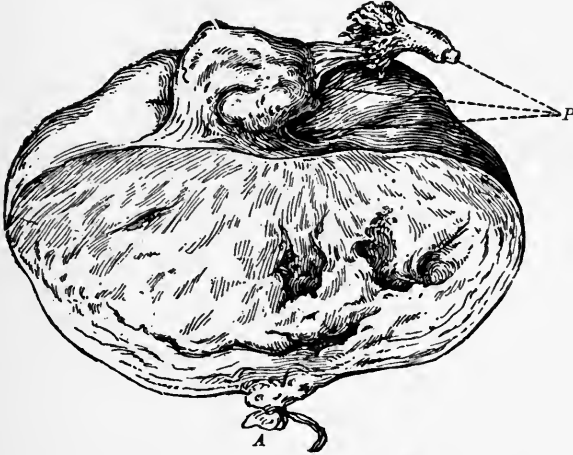
Fig. 20.
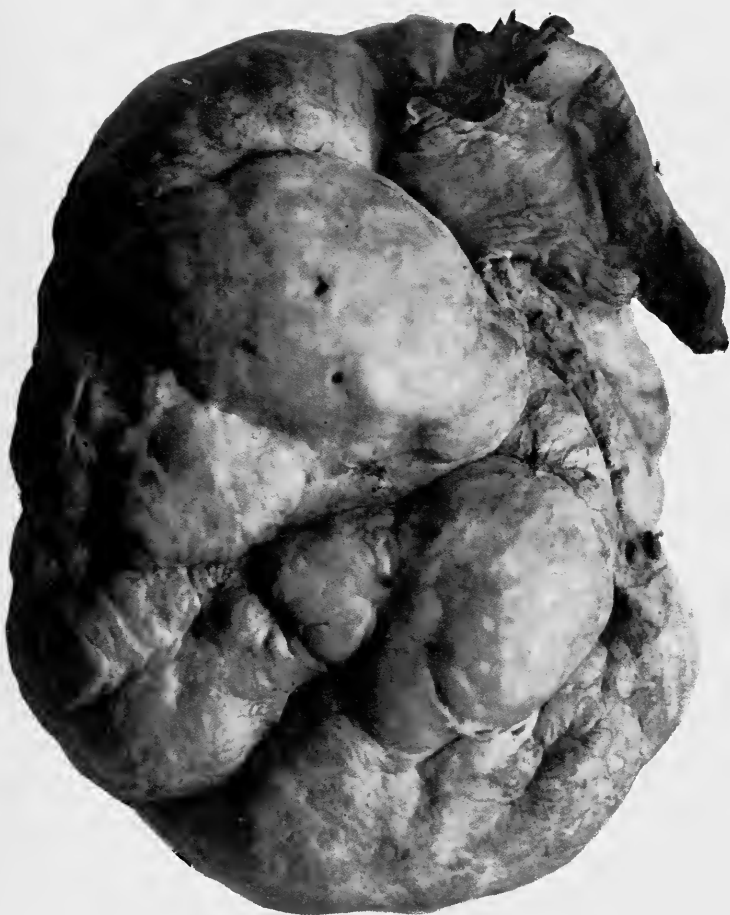
Fibroma of the ovary. (Bagot.)

nant class are represented by fibro-myomata, the malignant by sarcomata and carcinomata. They are especially interesting from a clinical stand-point.

Fibromata and Cysto-Fibromata.—Considering the amount of fibrous tissue in the stroma of the ovary, the rare occurrence of fibrous growths,
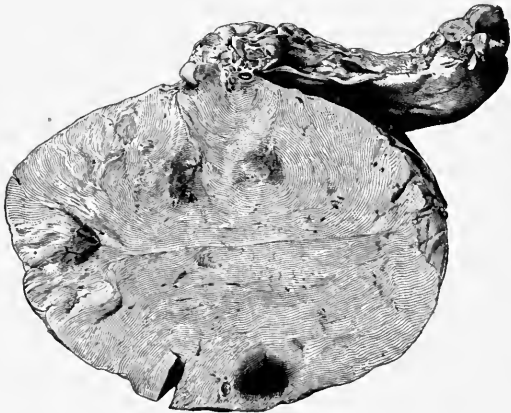
FIG. 18.

Fibroma of the ovary, with beginning cystic degeneration. (Mundé.)—*P*, pedicle; *A*, adhesion.

especially as compared with their frequency in the uterus, is worthy of note. Several writers have practically denied their existence, while others have stated that they are often observed. This discrepancy is doubtless due to the fact that sufficient care has not been exercised in distinguishing between fibro-myoma and spindle-celled sarcoma, which often present the same appearance macroscopically. A true fibrous neoplasm is to be distinguished from fibroid hypertrophy of the ovary, which may cause an enlargement of the gland to the size of a hen's egg. Careful microscopical examination of the specimen is necessary in order to determine its true character.

FIG. 19.

Fibroma of the ovary. (Museum of the College of Physicians and Surgeons.)

Pure fibromata of the ovary are more rare than fibro-myomata,—a curious fact, when we remember that the smooth muscle-fibres in the ovary are comparatively few in number and are confined to the paroöphoron. The entire ovary may be transformed into a fibrous growth, or only part of the
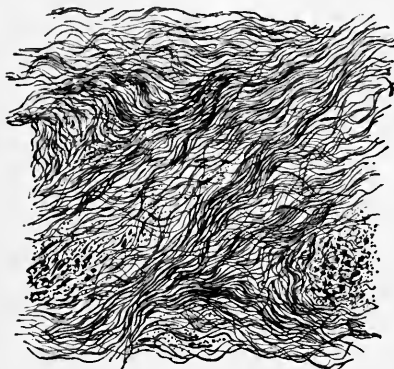
gland may be involved, the remaining portion being the seat of ordinary fibroid degeneration. The tumor is smooth, hard, and lobulated, being identical in appearance with a subperitoneal uterine fibroma; in fact, those who have denied the existence of these ovarian neoplasms have described them as subserous pedunculated fibroids that have become detached from the uterus. But the anatomical relations of the tumor and its pedicle, similar to that of a cystoma, at once show its true origin. On section they present the gross and microscopical appearances of an ordinary fibroma. They vary in weight from a few ounces to seven or eight pounds. Fibro-myomata attain a larger size than fibromata, since specimens have been described ranging from fifteen to sixty pounds in weight. Tumors consisting almost entirely of unstriped muscular tissue have been described, but it is probable that most of these were of a sarcomatous character. On section they present a reddish appearance, are softer than fibromata, and often show evidences of myxomatous and other degenerative changes. Microscopically they have a fibrous structure, with longitudinal bands of unstriped muscular fibres extending into it from the paroöphoron. The scarcity of blood-vessels in ovarian fibromata is noticeable, and has been offered as an explanation of the fact that they rarely attain a large size.

FIG. 21.

Microscopical appearance of an ovarian fibroma. (Howell.)

The secondary changes observed in these growths are similar to those seen in uterine fibroids, such as cystic, myxomatous, fatty, and calcareous degeneration. Interstitial hemorrhages occur in the larger growths, and suppuration as the result of torsion of the pedicle. Of these, cystic degeneration is the most interesting. In the smaller growths it may be limited to simple local softening, dropsy of a central follicle, or the result of interstitial hemorrhage. True fibro-cysts originate, as in uterine fibroids, from the dilatation of adjacent lymph-spaces ("geodes"), which finally coalesce and form large cavities filled with a clear serous fluid; through fatty degeneration, hemorrhage, etc., the fluid may become thick and turbid. True fibro-cysts of the ovary (*fibroma lymphangiectodes*) are exceedingly rare.[1]

It is a curious fact that ascites is a common accompaniment of ovarian fibromata, though a satisfactory explanation of the phenomenon has never been offered, since it occurs in connection with small neoplasms, when neither pressure on neighboring vessels, torsion of the pedicle, nor peritoneal irritation can be urged as a cause of the effusion. The practical importance

---

[1] For additional information on the pathology of these tumors, consult the author's paper in the American Journal of Obstetrics, vol. xv. p. 561.

of this fact is this,—that the surgeon usually associates ascites with malignant disease, and thus might be deterred from operating upon a solid tumor of the ovary which was really of a benign character.

Sarcoma.—A study of the normal ovarian tissue, especially in fœtal life, would lead to the inference that this variety of neoplasms should be the most common met with in this locality. While this is not the case, ovarian sarcoma is certainly more frequent than is stated by Schroeder (one in sixty). The relative frequency of sarcomata in children holds true in the ovary, where they form (according to Sutton) a considerable percentage of the entire number. The round-celled variety occurs, but is very rare as compared with the spindle-celled. It is probable that the majority of solid ovarian growths are fibro-sarcomata. Sarcoma is essentially a disease associated with sexual activity, and hence occurs in younger women. Both

Fig. 22.

Spindle-celled sarcoma of the ovary. (Doran.)

ovaries are usually primarily affected, an exception to other solid tumors, benign and malignant. They do not ordinarily reach a large size, their bulk seldom exceeding that of a man's head. Tumors weighing twenty or thirty pounds are generally sarcomata. Macroscopically, they may be

Fig. 23.
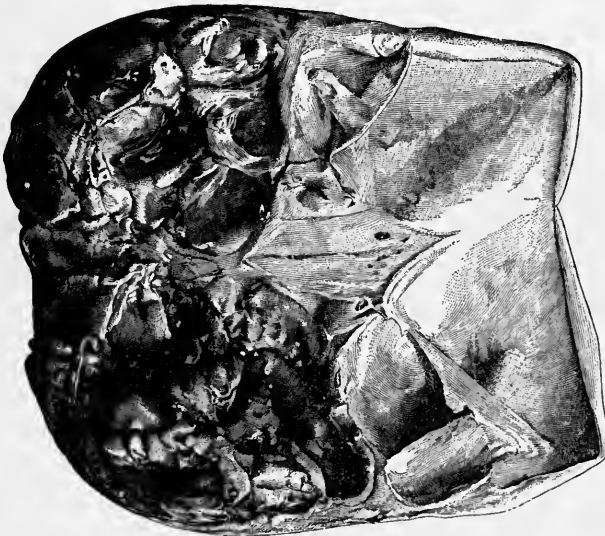
Myxo-sarcoma of the ovary. (Boldt.)

identical in appearance with pure fibromata, though sometimes they are softer and of a more reddish hue. They also present a similar appearance on section, though in the majority of cases more vascular.

Medullary sarcoma of the ovary cannot be distinguished from cancer, except by microscopical examination.

Mixed forms have been described, such as the mixed round and spindle-celled, myxo-sarcoma, alveolar sarcoma (Billroth), and sarcoma carcinoma-todes (Virchow), which are sufficiently described by their names. Fatty degeneration, hemorrhages, thrombosis, calcification, etc., are among the occasional degenerative changes. The statement made regarding the frequency of ascites and the consequent rarity of adhesions applies to the malignant as well as to the benign solid tumors of the ovary.

Sutton insists upon a separate classification for malignant ovarian tumors in children, describing them under the term *oöphoromata*. He calls attention to the following peculiarities : histologically they are identical in structure with the connective tissue of the fœtal ovary, they are bilateral, are rarely seen after puberty, may be associated with dermoids, tend to recur, and towards puberty assume an alveolar arrangement.

Reference has already been made to the possible sarcomatous degeneration of dermoids.

FIG. 24.
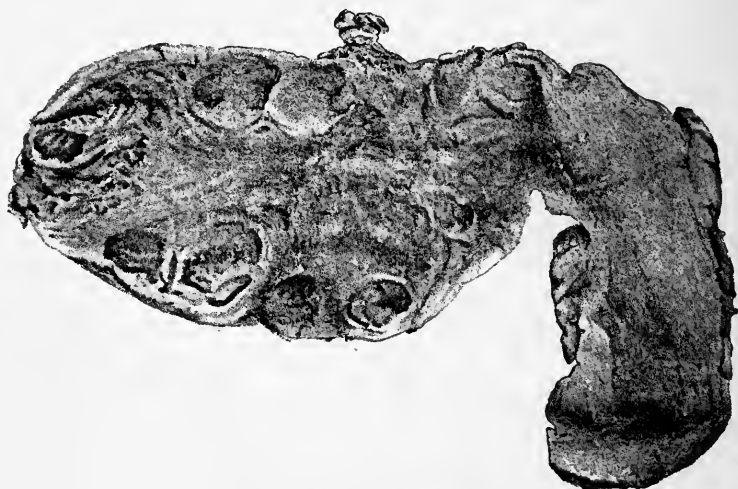
Fibro-carcinoma of the ovary (primary). (Chambers.)

Carcinoma.—In referring to "primary" and "secondary" cancer of the ovary we must bear in mind cancerous degeneration of a pre-existing tumor, especially of a cystoma. The reader will readily understand that a cysto-carcinoma may be a primary neoplasm, but a carcinomatous cyst never. Again, a distinction should be made between cancer of the ovary secondary to disease in an adjacent organ, as the uterus, and the same disease accompanying malignant growth in some distant locality, as the breast.

Primary cancer is now held to be much less frequent than secondary. The medullary form is most often met with, and presents the ordinary his-

tological peculiarities. The disease occurs quite frequently in women under thirty, like sarcoma, but, unlike the latter, affects both ovaries in only one-half of the cases. They rarely attain a large size, and appear as whitish, lobulated masses, having usually a doughy feel. In the initial stage there is simply a general symmetrical enlargement of the ovary. A section of the tumor at this stage may show either a diffuse homogeneous development of the disease, or the presence of small foci marking the sites of degeneration of the epithelium of separate follicles. In the latter case the gland might retain its functional activity for some time, as shown by the persistence of ovulation, and even by the occurrence of conception. These growths are the most vascular of the solid ovarian neoplasms, and are especially prone to undergo fatty degeneration. Necrotic changes lead to the formation of pseudo-cysts filled with bloody or colloid fluid. Myxomatous and colloid degeneration also occur. Extension to the
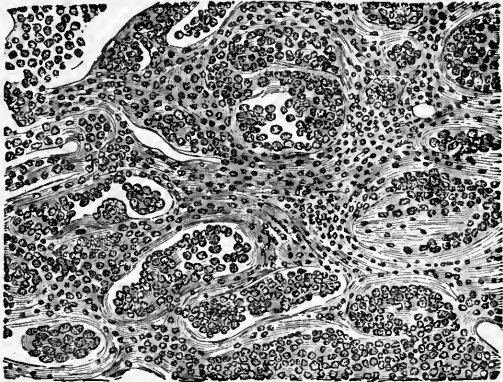
FIG. 25.

Medullary cancer of the ovary. (Tait.)

tubes, peritoneum, and uterus takes place early in the form of multiple nodules. Adhesions ultimately occur, but less early than would be expected, on account of the development of ascites, which in this connection is generally due to irritation of the peritoneum by the development of secondary nodules.

Metastatic deposits may develop in distant organs, especially in the liver and intestines. The retro-peritoneal glands are apt to be affected in the later stages of the disease.

Secondary cancer of the ovary is most often met with in connection with cancer of the body of the uterus, though rarely before the disease is considerably advanced. Its comparative infrequency in connection with epithelioma of the cervix—a fact which has been noted by those who have had much experience with total extirpation—is doubtless due to the peculiar distribution of the lymphatics at the bases of the broad ligaments, their connection with the ovary being less intimate than those in the upper borders. Lymphatic infection is also observed in ovarian abscess following puerperal septic endometritis.

Metastatic deposits have been observed in the ovary in cancer of the breast, and less often in primary disease of other viscera, especially the melanotic form. We must distinguish true metastasis from direct extension of the disease from the uterus, where there is also general involvement of the pelvic viscera and peritoneum. Here the organs are often so fused

together and united to coils of intestine that it is impossible to distinguish the ovarian growths until they have been dissected out, and even then their

FIG. 26.
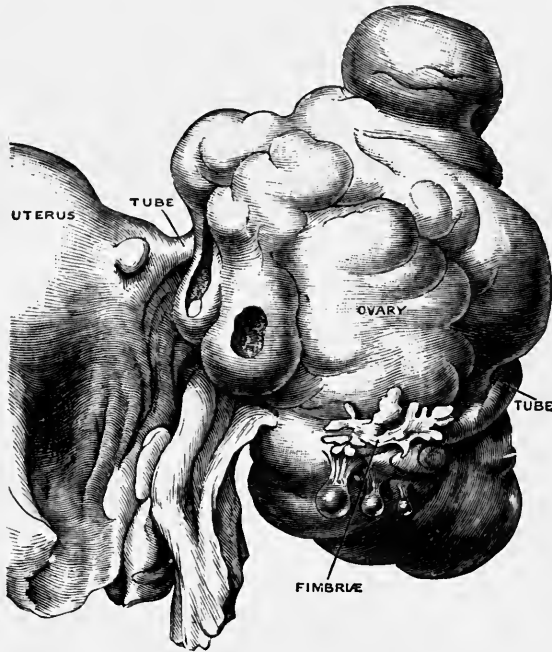
Carcinoma of the ovary secondary to carcinoma mammæ. (Sutton.)

original relations cannot be determined.   Such cases interest the pathologist rather than the surgeon, since they are the ones in which the latter must confine himself to an explorative incision.

MODE OF GROWTH.

As regards the etiology of ovarian tumors, it cannot be said that the various attempts to explain their origin have been very successful.   Traumatism, sexual excess, and oöphoritis have been mentioned as exciting causes.   The latter might be properly urged in the case of some fibrous and cystic growths in which there is well-marked evidence of fibrous hyperplasia due to former inflammation.   The frequent occurrence of dermoids and sarcomata before puberty would seem to indicate that they bear a close relation to the period of formative activity.   It may be stated in a general way that ovarian tumors develop most frequently during the period of sexual activity, and their frequent appearance in unmarried and sterile women suggests that constant ovulation, without the periods of rest enjoyed during pregnancy, is to some extent an etiological factor.   On the other hand, it is fair to infer that the increased congestion of the pelvic organs incident to pregnancy will accelerate the growth of a pre-existing tumor, as in the case of uterine neoplasms, though to a minor degree.

Clinically, two stages may be recognized in the growth of an ovarian tumor,—the intra-pelvic and the abdominal.   Formerly the latter was alone supposed to interest the surgeon, since the fact was not considered that the surgical importance of the neoplasm is not dependent upon its size alone. A tumor the size of an orange, impacted within the pelvis, may give rise to more serious disturbances than one which distends the abdomen.

In its initial stage an ovarian cyst tends to sink downward behind the broad ligament as in ordinary prolapsed ovary.   This presupposes a somewhat elongated pedicle ; with a short, fleshy pedicle it may be sessile from the outset.   To this rule there are, of course, numerous exceptions, since tumors of small size are found above the brim of the pelvis and even in the abdominal cavity, about which they can be moved freely, while they gravitate to the dependent side as the patient changes her position in bed. Rarely the growth may be situated in front of the broad ligament and uterus instead of behind them : this has been noted in the case of dermoids. It is, of course, the rule when the uterus is already retroverted.   The degree of prolapse of the incipient cyst varies.   It may reach the bottom of Douglas's pouch and cause bulging of the posterior vaginal fornix.   Its unilateral situation with regard to the uterus is an important diagnostic point.

The disturbances caused by a small movable tumor the size of an orange are usually slight, being limited to moderate anterior or antero-lateral displacement of the uterus, with resulting vesical irritation, and mechanical pressure on the rectum.   The resulting pelvic congestion naturally leads to a certain amount of uterine enlargement and increase in the menstrual flow, though it is not uncommon to meet with a small uterus in connection with a large abdominal tumor of long standing.

As the cyst enlarges, it begins to slip out of the pelvis and to encroach upon the abdomen, still retaining its unilateral position.   The intestines are pushed upward and backward, while the uterus is either drawn upward (if the pedicle is short) or is pressed downward and to the opposite side of the pelvis, being usually retroverted, sometimes anteverted. ' As the tumor continues to grow, it approaches the median line of the abdomen, which, instead of presenting an asymmetrical distention, becomes uniformly enlarged.   The intestines are displaced upward, and their normal peristaltic movements are interfered with.   Later the entire abdomen is filled by the growth, which compresses the stomach, rests against the under surface of the liver, and leaves a minimum of space for the viscera.   Pressure upon the large vessels leads to œdema of the lower limbs, while the renal circulation is interfered with.   The thoracic viscera share in the general disturbance, the breathing-space being encroached upon and the heart displaced.

The variations in growth shown in the case of the different forms of ovarian neoplasms are numerous.   The description above given applies to a simple multilocular cyst.   Dermoids are notorious for their slow growth and intra-pelvic development.   They are apt to become impacted in the

cul-de-sac of Douglas, so as to cause marked pressure-symptoms. Of the solid tumors, fibromata, unless quite small, are distinguished by their slow growth, free mobility, and situation at the side of and above the uterus. Sarcomata may at first grow quite as slowly, but eventually they increase rapidly, remaining unilateral until they attain a large size. Secondary nodules and metastases are apt to occur during the later stage of the disease.

In primary cancer of the ovary the gland is often uniformly enlarged, and is apt to have nodular masses on its exterior. The tumor is not usually prolapsed, but remains high up in the pelvis, being often fixed by adhesions. The disease is frequently bilateral. Not only does the tumor grow rapidly, but it early extends to the adjacent tissues, and is attended by peritonitis which causes general matting together of the pelvic contents. When the neoplasm encroaches upon the abdomen, the latter often presents an irregular, nodular form, due not only to the peculiar shape of the original tumor, but also to the presence of secondary disease of the omentum and peritoneum.

Papillomatous cysts which develop between the folds of the broad liga-ment are of relatively slow growth, and at first simply distend the liga-ment, displacing the uterus laterally and pressing upon the bladder. They may enlarge principally in one direction, or in several, extending downward to the floor of the pelvis, where they may compress the ureter, inward to become adherent to the uterus, and outward until they reach the pelvic wall. They may force their way upward into the abdomen, distending the lower part of it. When the papillary masses have perforated the wall of the cyst and extended to the peritoneum, the original contour of the tumor may be lost, so that it resembles a solid malignant growth. Double cysts of this character are more likely to become fused together than are those of the glandular variety. Union of opposite cysts usually occurs while they are in the intra-pelvic stage, and may be so intimate that their separate character is not recognized until after they have been enucleated and two distinct pedicles have been identified.

The size which an ovarian cyst may attain without being noticed either by the patient or by the physician is remarkable. The writer recalls a case in which he assisted in the removal of a cystoma weighing upward of forty pounds, six weeks after a normal delivery. No suspicion of its presence had been aroused until after the puerperal week, when the patient herself called attention to the fact that her abdomen had not diminished as much as usual. It is not uncommon for a gynæcologist to discover tumors of considerable size of which the patient had no knowledge whatever.

As regards the duration of the disease, we have no positive data. For-tunately, in these days no attempt is made to see how long a patient will survive. Lee has stated that the usual duration is from one to two years. While writing this article, the author has removed a tumor the weight of which was nearly one hundred pounds, and which had existed for twelve years without reducing the patient's strength beyond the possibility of an easy convalescence.

There is no regularity with regard to the growth of benignant neoplasms of the ovary, whether solid or cystic. Small cysts may apparently remain unchanged for a long period, and large ones, especially if oligocystic, may reach a certain size and remain stationary for years. Rapid growth after a long period of quiescence, sudden enlargement or change in contour, and the development of new, especially *acute*, symptoms mean the occurrence of certain changes within the tumor itself, or in its environment, which will now be described.

Changes within the Tumor.—Reference has already been made to certain degenerative processes which may take place within the tumor. These involve principally the cystic variety. The changes in solid tumors present no especial differences from those observed in the same growths elsewhere in the body. Fibromata and spindle-celled sarcomata may undergo softening and cystic degeneration, either through general œdema, or in consequence of hemorrhages, necrosis, etc. The tendency of certain sarcomatous and cancerous neoplasms to undergo softening is well known.

The degenerative changes which occur in the wall of an ovarian cyst are usually, though not always, most marked in the main cyst. Areas of local degeneration may represent simple fatty changes or actual inflammatory processes which end in suppuration and necrosis, or may terminate by fibrous thickening or the deposit of lime salts. The blood-vessels over the degenerated patch may rupture spontaneously, causing a moderate amount of hemorrhage into the sac, which, as it takes place slowly, possesses no clinical importance. Of more serious import is the rupture of large vessels in consequence of overstretching during the growth of the cyst, traumatism (especially from puncture), or interruption of the venous return, either gradually from pressure or suddenly from torsion of the pedicle. Proliferous cystomata seem to be particularly prone to hemorrhages, by reason of the vascularity of the papillary outgrowths. The accident may occur several times in succession, or a single profuse hemorrhage into the main cyst may distend it to its utmost capacity. The contents of the cyst will be changed to a thick, chocolate-colored fluid, a tarry coagulum, or a mass of solid fibrin, according to the age of the effused blood. Through complete interruption of the circulation, or infection, the clot may break down and exhibit the appearance seen in infected surgical cavities.

Reference to the localized degenerative processes in the cyst-wall leads naturally to the subject of general inflammation and suppuration, although it should be clearly understood that there is no direct causal relation between the two. Simple inflammation of the sac is most often due to traumatism, or to twisting of the pedicle. Dermoids, from their frequent impaction within the pelvis, are most liable to direct injury, especially during parturition, as will be noted subsequently. Doubtless the peculiar character of the cyst-wall, as well as the nature of the contents, predisposes them to acute degeneration, but it is more in accordance with modern pathology to attribute the majority of cases of acute suppuration to external infection.

Undoubtedly when tapping was frequently performed, in pre-aseptic days, many innocent cysts were transformed into suppurating sacs by direct infection, but this cause is now rare. In a certain proportion of the cases the infection may be transmitted through a diseased adherent Fallopian tube, but the most frequent channel is unquestionably the intestine; indeed, the common occurrence of degenerative changes in dermoids may be attributed quite as much to their intimate relation with the rectum as to the fact that they are the most subject to traumatism. Intestinal adhesions are quite common, suppuration is comparatively rare. Why infection should occur in one case and not in another is not always clear. Doubtless extreme thinness of the cyst-wall at the point of adhesion favors the osmosis of gas, even when there is no fistulous communication. Every abdominal surgeon must have noted the frequency with which the diseased appendix vermiformis is found adherent to ovarian cysts, and is prepared to subscribe to the view that infection is readily transmitted to the latter through this channel. The subsequent course of the suppurative process may be similar to that of a true pelvic abscess, with this difference, that in the latter the purulent focus is extra-peritoneal, and the pus tends to burrow along certain well-defined planes, pointing either externally or towards the most dependent point. A suppurating cyst may perforate into the peritoneal cavity, though this is rare, on account of the surrounding adhesions. Cases have been reported in which perforation of the abdominal wall occurred, but most frequently the cyst (especially a suppurating dermoid) discharges its contents into one of the adjacent hollow viscera, such as the small intestine, rectum, bladder, or vagina, when a permanent fistula is usually established. Rarely the sinus closes spontaneously and the sac collapses and eventually remains as a mass of indurated tissue. The cystitis occasioned by the communication of a dermoid with the bladder is of a peculiarly severe and obstinate type, and is apt to result in serious renal disease.

Gradual perforation of the cyst-wall may occur independent of previous inflammation. As before stated, this is of common occurrence in connection with papillomatous cysts. There is under these circumstances a gradual leakage of fluid into the abdominal cavity, but, as this is usually of an innocent character, it seldom causes more than a localized peritonitis, the fluid being absorbed or mingled with the accompanying ascitic fluid. Perforation may also occur from simple localized thinning of the cyst-wall in consequence of degenerative processes. This may occur on several occasions in the same case, as may be inferred from the finding of old cicatrices at the time of operation. Cases of spontaneous cure of ovarian cysts were doubtless of this nature when the fluid was bland and non-irritating. Small secondary cysts may rupture into the peritoneal cavity, just as adjacent loculi communicate by perforation of their septa, without any ill results. There is, of course, a certain amount of leakage in every case in which a cyst is tapped through the abdominal wall, the consequences of which depend entirely upon the character of the growth and the contained

fluid.   It is the rule for a localized inflammation to occur at the site of the puncture, as shown by the development of parietal adhesions.   In the case of a papillomatous cyst, tapping may be followed by the same results as spontaneous perforation,—*i.e.*, extension of the papillary growths to the peritoneum.   Cysts may discharge their contents into adherent viscera through simple thinning of their walls, without previous suppuration, though this is the exception; if the sac communicates with the gut it is apt to become infected, when the condition will be the same as that already described.

Rupture is an accident of far greater clinical significance than perforation, since it means not the gradual leakage of fluid, but the sudden discharge of nearly all the cyst-contents into the abdominal cavity, with results more or less serious, according to the character of the same.   The accident may be spontaneous, being due to gradual thinning of the wall and over-distention, or may be due to traumatism, as a fall or blow, or to extreme pressure from the pregnant or parturient uterus.   Excessive venous congestion, due to acute torsion of the pedicle, is another well-recognized cause.   The rupture of secondary cysts may be unattended by serious consequences; so, too, the watery contents of a unilocular cyst may escape into the peritoneal cavity, where it is readily absorbed and is carried off by the kidneys.   If the rent is not large, it may close and the sac may refill, perhaps to rupture again at the same or at another point.   If a fistula remains, there is an intermittent discharge of fluid, which accumulates as a pseudo-dropsy, or occasions a low grade of peritonitis which results in a true ascites that may entirely mask the original condition. There is apt to be more or less hemorrhage from the over-distention of the vessels following the sudden diminution of pressure; this may reach serious proportions, especially when rupture follows axial rotation.

The contact of fluid from a suppurating dermoid cyst causes great irritation of the peritoneum, setting up a general inflammation of that membrane that may be rapidly fatal.   Colloid material is not only quite irritating, though not infectious, but is not absorbed.   It is often distributed through the entire cavity, covering the viscera with a thick viscid layer and causing a more or less acute peritonitis which may soon be fatal (especially if there is an admixture of septic matter), or may assume a low grade with resulting ascites.   Sometimes the colloid matter may become organized, or may apparently develop secondary growths on the peritoneum,—the so-called *pseudo-myxoma peritonei* of Werth.   When papillomatous cysts rupture there is a general diffusion of the outgrowths, which become engrafted upon the parietal and visceral peritoneum, the formation of secondary growths and the development of ascites being much more rapid than in cases of gradual perforation.   The same phenomena in the case of a cyst that has undergone cancerous or sarcomatous degeneration are, of course, of more serious import.   On the whole, the accident is a serious one, since it has been estimated that before the days of prompt surgical interference the mortality was at least forty per cent.   In some

instances the patient has actually succumbed to shock, while in others the resulting peritonitis was so virulent that it terminated fatally in three or four days. The character of the fluid, the amount which escapes, as well as the suddenness of the accident and the occurrence of profuse hemorrhage, modify the result.

Torsion of the pedicle, as the most common cause of the complications just described, deserves our careful study. Sutton states that it occurs in about ten per cent. of all cases of ovarian and parovarian tumors. Axial rotation of an ovarian tumor implies perfect mobility, a comparatively long pedicle, and the application of one or more forces (either sudden or continuous) acting in such a way as to cause the rotary movement. Small movable tumors are much more liable to rotate; non-adherent dermoids seem to be peculiarly liable to the accident. Fibromata and sarcomata with long, slender pedicles offer favorable conditions, the reverse being the case with solid tumors which have such short pedicles as to be practically sessile. Rotation may be partial, so that there is only a half-turn of the pedicle, the cyst returning to its former position after the initial pressure is removed. Many of these cases are doubtless overlooked at the operating-table. There may be one or three or four complete turns; Croom reports a case in which the pedicle was twisted twelve times. (!)

Torsion may be "acute" or "chronic;" i.e., it may take place suddenly or gradually. The acute cases are far more serious than the chronic. Rotation may occur in either direction,—from left to right, or the reverse, —though rotation towards the median line seems to be the rule. Cases of double torsion have been reported where tumors of both ovaries were present.

Various ingenious explanations have been suggested to account for the phenomenon, but it must be evident to any one who has studied the subject that no single etiological factor can be made to apply to all cases. That there is a direct relation between pregnancy and parturition and axial rotation is well known. It was noted in twenty-five per cent. of the cases reported by Thornton. Torsion during pregnancy is more apt to be gradual, while after abortion or delivery at full term it takes place suddenly, in consequence of the rapid lessening in the size of the uterus and the consequent sinking of the tumor towards the pelvis.

The primary result of torsion is interruption of the circulation in the vessels of the pedicle, the consequences of which are more or less serious, according to the suddenness and completeness of the arrest; this depends upon the length and thickness of the pedicle and the tightness of the torsion. As the thicker-walled arteries resist compression longer than the veins, blood is carried to the tumor, but is unable to return, so that extreme venous congestion results. The veins become enormously dilated and may rupture, thus increasing the tension of the cyst-wall, which may also rupture, fatal hemorrhage occurring. This is, fortunately, rare, the more common result being moderate hemorrhage or extravasation.

The appearance of a rotated cyst at the operating-table is characteristic. Instead of the usual white, glistening hue, it presents a deep-red, some-times almost black, color, the veins near the pedicle being prominent. Section of the cyst-wall shows that its color is due not to gangrene, but to the uterine conges-tion and extravasation. The fluid may present the ordinary chocolate color, or may be black and tarry from the presence of coagulum, as in a case in which the writer had an opportunity to make a post-mortem examination. While necrosis may result, actual moist gangrene of the cyst must be rare if there has been no infection from without. What does occur in these acute cases is the rapid development of perito-nitis, which is naturally of a virulent type. Simultaneous twisting of a coil of intes-tine, leading to complete obstruction, has been noted in a few cases, a fatal termina-tion being inevitable if there is not prompt surgical interference.

FIG. 27.

Adhesions on the surface of an ova-rian cyst which had been separated from its pedicle by torsion. (Doran.)

The phenomena seen in cases of acute rotation where the pedicle is so thick that the circulation is not completely arrested, as well as those in which it takes place gradually, simply differ in degree from those already described. The pedicle becomes thickened and œdematous, its vessels are thrombosed, and it may undergo such degeneration through fatty changes as to be entirely separated from the uterus. Meantime a circumscribed peritonitis surrounds the tumor, rendering it immovable. These adhesions may develop new vessels sufficient to nourish the growth, even when the pedicle has been completely separated, though it ceases to grow and may undergo partial atrophy.

Changes outside of the Tumor.—The most important changes in the environment of an ovarian neoplasm directly due to its presence are perito-nitis with the formation of adhesions, ascites from irritation of the perito-neum, and pressure-effects on neighboring or distant viscera. Since these have a direct bearing upon prognosis, they deserve some attention. Allu-sion has already been made to several causes of peritonitis referable to the presence of cysts, torsion of the pedicle, suppuration, and rupture being followed by the most acute and virulent type; whereas perforation of the wall of a papillomatous cyst, with extension of the growths to the peritoneum, leads to a subacute form of inflammation which is not of a threatening character.

Localized peritonitis is apt to be present in connection with large multi-locular cysts of long standing, probably due purely to mechanical irritation

of the apposed serous surfaces. Yet immense tumors which have existed for years have been found entirely free, while small intra-pelvic cysts are often firmly adherent. In fact, it is impossible, in most cases where there has been no history of traumatism or external infection, to assign a cause for the complication. There may be one or several attacks, which may be strictly localized or general. It must have been noted by every operator that the condition of the accompanying tube (especially if it contains pus) has much to do with the initial attack. There is nothing peculiar about the progress of the inflammation, as it usually results either in general thickening of the peritoneum or in the development of adhesions, which differ in size, firmness, etc., according to the more or less intimate relation of the affected serous membrane to the outer surface of the tumor. Surgically, adhesions are recognized as parietal, visceral, and intra-pelvic. The first are slight or firm, according to their age and the close apposition of the tumor and abdominal wall during the process of organization. Mobility of the neoplasm implies the development of thin bands, or even long, slender filaments. The cyst-wall and parietal peritoneum may be so intimately united that it is almost impossible to separate them at the operating-table. Adhesions to the abdominal viscera are more or less serious, according to their extent, firmness, and vascularity. If recent, they are often friable and easily separated ; but if of long standing, there is apt to be a rich development of new blood-vessels, sufficient to give rise to serious hemorrhage if they are torn. This applies most of all to omental adhesions. Strange to say, the presence of general intestinal adhesions does not seem to interfere with the peristaltic movements to any great extent, so that obstruction is a rare complication. When this occurs (excluding cases of axial rotation), it is more apt to be due to a single band of adhesion than to the agglutination of several coils. The worst forms of adhesions are found in connection with cancer, especially in secondary deposits. The appendix vermiformis, as before stated, is not infrequently adherent to an ovarian cyst ; the danger of infection through this source, as well as through a firmly adherent loop of intestine, has been alluded to. Adhesions to the stomach and liver are met with only in cases of long-standing tumors of sufficient size to fill the entire abdomen, and are not usually very firm or especially vascular. Such tumors are, fortunately, rarely met with at the present day.

Intra-pelvic adhesions constitute one of the worst complications with which the surgeon has to deal, not only from the difficulty of separating them, but from the danger to important structures during the process. Dermoids become adherent to the uterus, rectum, and Douglas's pouch, while small tumors situated laterally are fixed in such a position as to press upon the uterus, iliac vessels, and sacral nerves. Repeated attacks of peritonitis lead to fusion of the pelvic organs, which may be completely shut off from the abdominal cavity by overlying coils of adherent intestine. As before stated, the causes of such repeated attacks of pelvic inflammation are often unknown. Infection of a retro-uterine cyst in close

proximity to the rectum is doubtless a common cause, while traumatism (especially in the case of dermoids) is another.   Simple unilocular cysts, with watery contents, are often found to be buried in firm adhesions, possibly the result of recurrent attacks of inflammation referable to the presence of a diseased tube.   Intra-ligamentous cysts, either simple or papillomatous, are subject to the same complication, being adherent to the bases of the broad ligaments, in dangerous proximity to the ureter and uterine artery. Large abdominal tumors may also contract adhesions to the pelvic viscera and the peritoneum.   The bladder may be drawn up in front of the tumor and become so firmly attached to it that its recognition and separation at the time of operation are no easy matter.

By the term "pressure-effects" we understand the results of mechanical pressure of the tumor at any stage of its development.   The visceral changes thus occasioned are to be distinguished from coexisting disease of the abdominal or thoracic viscera which is independent of the neoplasm, though it may be aggravated by it.

One of the first results of the presence of an intra-pelvic tumor is displacement of the uterus, often a flexion sufficient to cause more or less dysmenorrhœa, especially if the organ becomes adherent in an abnormal position.   Intra-ligamentous cysts simply displace it to the opposite side of the pelvis.   If the tumor becomes impacted in Douglas's pouch, the pressure on the rectum causes not only obstruction of its lumen, but venous obstruction, resulting in hemorrhoids, proctitis, etc.   At the same time, pressure on the neck of the bladder leads to vesical irritability, though rarely to actual cystitis, with its secondary complications, ureteritis and pyelitis.   Perforation of a suppurating cyst into the bladder results in the development of a peculiarly obstinate cystitis.   Calculi are often formed around hair, teeth, etc., discharged from a dermoid cyst.   The writer has noted a fatal suppurative nephritis in two or three cases.   Pressure on the ureter by a small impacted tumor may lead to the most serious consequences, varying with the partial or complete occlusion of the duct, hydronephrosis being the result of the latter condition.   Venous obstruction may be confined to the intra-pelvic vessels, causing œdema of the lower limbs, or rarely the vena cava itself may be compressed, leading to the development of ascites.   Large abdominal tumors press directly upon the viscera, causing more or less serious disturbances, which are not to be explained by simple displacement.   Intestinal obstruction does not occur from mere pressure independent of adhesions, as the intestines are able to accommodate themselves to the smaller space allowed to them, just as in pregnancy; but cases of ileus have been reported from the strangulation of a loop of gut by the pedicle.   Minor degrees of obstruction are indicated by the presence of tympanitic distention and obstinate constipation.

That the kidneys, although not subject to direct pressure, are seriously affected by a tumor of long standing is evident from the condition of the urine, which is often diminished in amount and loaded with urates.   Renal

congestion is caused not only by pressure on the urine, but by venous obstruction. " Reflex irritation" has also been mentioned as an element in the renal disturbance. This condition of affairs, if allowed to continue, must lead to structural changes, even to chronic interstitial nephritis. Deaths from acute suppression and uræmia following ovariotomy, where no evidence of organic kidney-trouble had been discovered before operation, must be attributed to this cause. The stomach may be displaced by a large cyst and its functions seriously impaired. If the pressure is long continued, chronic gastritis is the result. As regards the thoracic viscera, the heart seems to escape, except in cases of long standing, when dilatation of the right auricle and ventricle and fatty degeneration have been noted. Fenwick believes that this is a direct result of the presence of the neoplasm, and constitutes a formidable complication of ovariotomy.

Not only is the diaphragm pushed upward and the thoracic cavity diminished by the growing tumor, but the sternum and lower ribs are pushed outward, so as to constitute a permanent deformity. Collapse of the air-cells in the lower lobe, pulmonary œdema, bronchitis, and pleural effusion are resulting complications which seriously affect the prognosis of an operation. It should be noted that pleural effusion in these cases is due rather to obstruction of the circulation than to actual inflammation of the pleura, as shown by its rapid disappearance after removal of the pressure.

These are, briefly stated, the principal results of mechanical pressure, such as have been noted in cases of long standing. It is hardly necessary to add that the majority of them are avoidable by an early operation, for which they furnish a forcible argument, rendering further comment unnecessary. Among the purely mechanical effects may be mentioned extreme distention of the abdomen, with thinning of the wall, distention of the superficial veins and anasarca, umbilical (rarely inguinal) hernia, varicose veins of the labia and lower limbs, general œdema of both lower extremities, and neuralgiæ, attributable to pressure on the sacral plexus, all of which speedily disappear when the cause is removed. These are not important in themselves, except so far as they add to the discomfort of the patient by wearing out her general health and thus hastening the fatal termination of the case, unless she is relieved by surgical art.

COMPLICATIONS OF OVARIAN TUMORS.

These may exist in connection with either the pelvic, the abdominal, or the thoracic viscera, and will be considered in this order.

(a) *Pelvic Organs.*—Complications in connection with the uterus may be either physiological or pathological, the former being both more common and more important.

The subject of pregnancy as a complication of ovarian tumors is one which possesses unusual interest for the obstetrician as well as for the abdominal surgeon. It is impossible, in view of the limitations imposed

in this article, to discuss it exhaustively. For further information the reader is referred to monographs and works on obstetrics.

The occurrence of pregnancy in connection with neoplasms of the ovary has been observed so frequently that it is no longer regarded as a pathological curiosity. There is no reason why conception should not occur when one ovary is in a normal condition, as ovulation and menstruation proceed as usual; but why it should occur when the unaffected adnexa are buried in adhesions is not clear; still less so when both ovaries are the seat of neoplasms. So long as any of the normal stroma remains, even though it is represented by a localized thickening in the wall of a large cyst, it is fair to infer that, provided that the tube remains pervious, conception is still possible. More difficult of explanation are those curious cases in which this has occurred in connection with double malignant tumors, the most careful examination failing to reveal any traces of the normal parenchyma. The only plausible explanation is that the disease made such rapid progress after impregnation had taken place as to destroy such slight remains of the stroma as sufficed for the maintenance of the function of ovulation.

Fig. 28.

Pregnancy complicated with an ovarian cyst.   (May.)

It is important to consider, in turn, the effect of pregnancy and parturition on the tumor and the manner in which the pregnant uterus is affected by the latter. The treatment of the complication will be discussed in another section. There is little doubt that the increased pelvic congestion incident to the physiological state furnishes an additional stimulus to the growth of an incipient cyst. Any one will be prepared to admit this who has had an opportunity to examine the normal or diseased ovary during Cæsarean section. Provided that the growth is movable and has a sufficiently long pedicle, it is first crowded over to one side of the pelvis, then slips above the brim into the abdominal cavity, where it may attain an immense size before its expansion is interfered with by the growing uterus. Such small, freely movable tumors are especially liable to undergo axial rotation, as already stated. But the tumor may become imprisoned below the sacral promontory, even though it is non-adherent, when it cannot develop upward, but must expand laterally and towards the posterior vaginal fornix. Prolapse of the uterus from mechanical pressure may result during

the early months.   Impaction of a retro-uterine dermoid cyst is a serious complication, since the resulting pressure may lead to rupture, inflammation, and suppuration.   The pressure-symptoms due to the tumor itself are increased by the presence of the large uterus.   An attack of peritonitis may cause the fusion of the two, with a necessary interruption of the

Fig. 29.
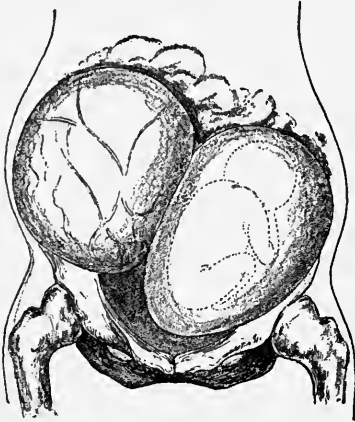
Fig. 30.

Pregnancy with an ovarian cyst. (Barnes.)

Labor complicated with an ovarian cyst. (Barnes.)

pregnancy.   In the case of movable abdominal tumors, as the uterus rises out of the pelvis it pushes the neoplasm to the opposite side of the abdomen, which may accommodate both tumors, with no serious results except a natural augmentation of the usual pressure-effects, which may become so extreme, especially dyspnœa and disturbance of heart-action, as to threaten the life of the patient.   Axial rotation and rupture are still possible dangers, the latter especially in the case of thin-walled adherent cysts.   It is remarkable how much compression a cyst will stand.   Fortunately, large abdominal tumors do not seem to share in the impetus of pregnancy to the same degree as the intra-pelvic variety, their growth being probably somewhat retarded by the pressure to which they are subjected.

The question of labor complicated with ovarian tumors is one that concerns us here principally from a pathological stand-point.   Although any tumor, no matter what its size or position, is liable to serious injury during evacuation of the contents of the uterus, either prematurely or at full term, it is astonishing how little influence it may have on the growth.   Small retro-uterine tumors, if movable, may slip out of the pelvis before the head engages, or, if caught between the head and the sacral excavation, may be so compressible as to suffer no harm.   Rupture of the cysts under these circumstances would be attended by the results already mentioned, varying in severity according to the character of their contents.   Even though labor may terminate normally, the cyst may be so bruised from prolonged pressure that suppuration occurs.   The risk of axial rotation from sudden emptying

of the uterus applies principally to cysts with long pedicles which have slipped out of the pelvis.

As regards the influence of the tumor itself on the course of pregnancy and parturition, the statistics of former writers are clearly at fault. Modern observers agree that the risks have been much exaggerated. Doubtless abortion is a not uncommon result of the impaction of small tumors within the pelvis, simply from interference with the progressive enlargement of the uterus, and this is in itself a useful and conservative process. Premature delivery also occurs from the presence of large abdominal growths. Adhesion of the neoplasm to the uterus might be a cause of dystocia, as well as of post-partum hemorrhage. There is no reason to infer any injury to the organ itself from the presence of the tumor, except so far as absolute obstruction of the parturient canal would lead to the danger of rupture during labor. The situation, in a word, is this. The uterus during the early months is displaced forward or laterally by a small tumor; rarely it is prolapsed. As it rises out of the pelvis it develops in the direction of least resistance, moving to the opposite side of the abdomen from the growth, and gradually encroaches upon the median line at the expense of the more compressible cyst. After the organ is emptied, the tumor, if large, expands and occupies its usual position, descending towards the pelvic cavity if of moderate size and freely movable, otherwise remaining in the abdomen. The intestines, hitherto pushed upward, now descend and resume the position which they occupied before pregnancy. The statements made with regard to the complication of ovarian tumors with pregnancy apply largely to cysts, solid tumors being comparatively rare. The risks in connection with solid growths (especially the softer malignant ones) would be most from degenerative changes incident to pressure. Twisting of the pedicle is also liable to occur in the smaller fibrous and sarcomatous tumors. Impaction of a solid tumor within the pelvis would naturally cause marked dystocia, in view of its unyielding character.

Neoplasms of the uterus may coexist with ovarian tumors without giving rise to any special disturbances. Uterine fibroids, if small, may have no effect on the ovarian growth; the conditions in the case of large fibroids are much the same as in pregnancy, except that the uterine tumor is now relatively of much slower growth. Axial rotation of a cyst may be produced as in pregnancy. Adhesion of the cyst and fibroid may occur and lead to serious pressure-symptoms. The writer recalls a case in which a subperitoneal fibroid which had become fused with an ovarian cyst was detached from the uterus and received its nourishment entirely through the latter. In general, the pressure-effects resulting from the presence of both ovarian and uterine tumors partake of the peculiar characteristics of both, those from the latter being more intra-pelvic. The tendency of the opposite ovary to become cystic in connection with fibro-myoma of the uterus is a familiar fact and has a direct bearing on the question of its removal during ovariotomy.

42

Since extirpation of the uterus for malignant disease has become so common, the frequency of coexisting cystic degeneration of the ovaries and small ovarian cysts, both single and double, has been remarked. The writer has seen only one instance in which carcinoma of the cervix was associated with a large ovarian cyst, but there is no reason to regard the coincidence as especially rare. The increased congestion due to the presence of the tumor may readily accelerate the progress of the malignant disease, and, on the other hand, a simple cyst has been known to undergo cancerous or sarcomatous degeneration secondary to a similar condition in the corpus uteri. The indication to remove an ovarian cyst, if possible, during vaginal extirpation (it would naturally be done at the time of an abdominal hysterectomy) is therefore a clear one; but, on the other hand, there would be no object in performing ovariotomy upon a patient with inoperable cancer of the uterus.

The presence of accompanying disease of the adnexa deserves some mention. The condition of the opposite ovary is a point of much practical interest, since the surgeon must be able to recognize it promptly at the operating-table. We should naturally expect to find it in every case the seat of chronic congestion and well-marked organic changes, in view of the extra work thrown upon it, so to speak. On the contrary, it is not infrequently perfectly healthy, as shown by the perfect performance of all its functions for years after ovariotomy; yet the writer believes that it is the rule to find macroscopical evidence of pathological changes in the gland in the shape of enlargement, thickening of the cortex, and follicular dropsy (both central and peripheral). Not infrequently a small unilocular cyst, either simple or dermoid, exists in connection with a large tumor on the opposite side. Any marked enlargement of the opposite ovary in connection with a solid tumor is to be viewed with suspicion as an evidence of incipient malignant disease. Hæmatoma has been noted in some instances, —an evidence of extreme venous congestion with hemorrhage into a preexisting cyst. Abscess is rare, and is either secondary to tubal disease or the result of infection through adhesion of the ovary to the gut. Allusion has already been made to the simultaneous development of two tumors, so that it need only be said that there is no rule regarding the relative rapidity of their growth. One may remain intra-pelvic, while the other fills the abdomen. The earlier fixation of one by peritonitic adhesions may explain their different behavior. Fused cysts are those which have literally grown together and have a common cavity, through absorption of the septum, but separate pedicles. An ordinary ovarian cyst may be associated with a parovarian or an intra-ligamentous cyst on the opposite side.

The changes in the tubes are recognized by the modern surgeon as extremely significant; more so, in fact, than those in the opposite ovary. Salpingitis is a common accompaniment of small ovarian cysts, and, as before stated, is doubtless responsible for the attacks of pelvic peritonitis which

result in parietal and visceral adhesions. Although the Fallopian tube undergoes marked changes during the growth of a large tumor, it is less apt to be the channel for infection than in the former case, probably because it is less pervious. Pyosalpinx is a serious complication of intra-pelvic tumors which are otherwise innocent. Hydrosalpinx is met with not infrequently, the distended tube being often as large as the accompanying cyst. The mode of development of tubo-ovarian cysts has already been mentioned. Cystitis with resulting pyelitis, not due to the presence of the tumor, is a serious complication.

(b) *Abdominal Viscera.*—Acute or chronic disease may develop independently of the neoplasm. Renal affections are especially serious from a surgical stand-point. In the writer's experience, contracted kidneys are by no means rare, their presence being unsuspected until the post-mortem. Chronic diffuse nephritis is less common. Hydronephrosis has been noted from pressure on the ureter by inflammatory nodules within the pelvis, and pyelitis (with or without the formation of calculi) secondary to cystitis of independent origin. The increased congestion due to the presence of the tumor would naturally tend to aggravate pre-existing troubles.

The writer has found at autopsies on patients dying after ovariotomy, nutmeg and fatty livers, distention of the gall-bladder, and numerous gall-stones, none of which seemed to have given rise to any symptoms during life. Cirrhosis is a much more serious matter. Chronic catarrh of the stomach, ulceration, and dilatation may exist, conditions which would be aggravated only by the mechanical pressure exerted by an unusually large tumor. Complications on the part of the intestines may seriously affect the prognosis. Old adhesions and stenoses from the cicatrices following ulceration have given rise to complete obstruction independently of the tumor, as in a fatal case reported by the writer. Enteritis, both simple and tuberculous, has been noted, and at one post-mortem he found a diphtheritic colitis, evidently of long standing, which had led to perforation.

Inflammatory thickening of the omentum and peritoneum may antedate the development of a simple cyst. The possibility of miliary tuberculosis is to be borne in mind, since it may be of extra-pelvic origin and coexist with an ovarian tumor.

Reference has already been made to ascites as the direct result of ovarian tumor, due sometimes to the mere irritation of the peritoneum caused by the presence of the neoplasm, sometimes to the development of secondary papillomatous or malignant growths, less often to mechanical pressure on the great vessels. Attention was also called to the pseudo-ascites which has its origin in rupture or perforation of the cyst, with leakage. But, aside from these local causes, it should be borne in mind that ascites, with or without anasarca, may result from the usual visceral causes,—chronic disease of the heart, liver, or kidneys. It is important to distinguish between the two forms of hydroperitoneum in connection with the question of operative interference. Chronic peritonitis (and especially the tuber-

culous variety) may also be mentioned.   So-called encysted ascites may complicate ovarian cyst, as in the case of a patient recently operated upon by the writer, when a collection of fluid within the pelvis was mistaken for a second cyst.

(c) *Thoracic Viscera.*—It is important to distinguish between functional and organic cardiac troubles in deciding as to the propriety of operative interference.   The ordinary rules of physical examination will guide us in this respect.   Valvular disease is not as serious a complication as might be supposed, provided that compensatory hypertrophy exists.   Fatty degeneration and dilatation render the prognosis far more grave.   This will be referred to in connection with the contra-indications to ovariotomy.   Pericarditis and permanent displacement of the heart by old adhesions are regarded by some authorities as constituting a condition which may be seriously, if not fatally, affected by the pressure of a large tumor.   The writer performed an autopsy upon a patient with an immense tumor, who died from cardiac paralysis without operation; the right cavities of the heart were only moderately dilated, no other visceral lesions being found.

Acute pulmonary affections, such as bronchitis, pleurisy, and pneumonia, are peculiarly obstinate when occurring in connection with large cysts, the symptoms being aggravated by the diminution of the breathing-space. Chronic bronchitis, especially in old subjects, is a bad complication, in view of anæsthesia and confinement in the recumbent posture after operation.   Old pleuritic effusions are equally unpleasant: the writer witnessed a sudden death from this cause during anæsthesia.   Pleuritic adhesions, atelectasis, and emphysema are of frequent occurrence and are comparatively unimportant.

It has been stated by some authorities that pulmonary phthisis is a rare complication of ovarian tumors.   This agrees with the writer's experience. Should it develop in a subject with a large abdominal growth, the disease would be affected unfavorably, for the reasons already mentioned.   In addition to the affections above mentioned there are many other local and general diseases which may coexist with ovarian tumors and render the patient's condition more serious, as well as complicate the operation.   Of these, it is only necessary to mention syphilis, marked anæmia and leukæmia, malaria, and other similar disorders.   Diseases of the nervous system are most important.   The question of ovariotomy in the insane has been settled satisfactorily.   The necessity of brevity forbids our dwelling any longer upon this interesting subject.   To summarize : any acute or chronic disease may coexist with an ovarian tumor, and may either pursue its usual course or be subject to aggravation directly due to the presence of the neoplasm, thus impairing the patient's health more rapidly than would otherwise be the case, and increasing the risks of delay in operative interference.   That, in spite of all these complications, the statistics of ovariotomy are so favorable furnishes a strong commentary on the state of modern abdominal surgery.

CLINICAL HISTORY.

As has been stated, the presence of the tumor may be unknown to the patient until her attention is attracted to it by enlargement of the abdomen and a vague sense of discomfort due to its increasing size. The graphic clinical picture presented by the older writers of women who have suffered for years with immense abdominal growths is not often witnessed at the present day, thanks to the general intelligence of both the profession and the laity. Since every case presents features peculiar to itself, the reader will naturally infer that the lists of symptoms detailed in text-books do not represent a single typical case, but such as have been noted in many different ones. Thus, one cyst may occasion marked disturbances during the initial stage of its development, few or none of the ordinary pressure-effects being noted after it rises out of the pelvis, while another attains a considerable size before it gives rise to any symptoms, either from mechanical pressure or from the development of inflammatory complications.

One would expect to observe well-marked local symptoms during the early development of ovarian tumors, in view of those commonly noted in connection with chronic hyperplasia and cystic degeneration of the ovary. Why localized pain should be present in one case and not in another is not always clear, even after the abdominal cavity has been opened. Doubtless the position of the organ (in Douglas's pouch), the presence of inflammatory thickening of the unaffected portion of the stroma, and, above all, the coexistence of tubal disease with perioöphoritic adhesions, explain the stormy inception of some cystic tumors.

Menstruation may be perfectly regular as to its recurrence and the amount of the flow, but dysmenorrhœa of the usual type will of course result from the condition of the ovary and tube described. Menorrhagia is the rule, due to chronic congestion and resulting endometritis fungosa. The gynæcologist's attention is sometimes attracted to the presence of a small cyst while seeking for an explanation of this symptom. Amenorrhœa in the early stage usually means the simultaneous development of two tumors, especially if they are malignant. If associated with enlargement of the breasts, nausea, etc., pregnancy may readily be suspected. As a later symptom, scanty menstruation or amenorrhœa is simply an expression of the general depreciation of the system. There may be irregular discharges of blood; such metrorrhagia in women at or near the climacteric might awaken suspicions of the development of malignant disease of the uterus. Sterility, when present, may be due to causes outside of the ovaries, such as stenosis, endometritis, etc. Pregnancy would be less likely to occur in connection with a bilateral tumor. As a growing tumor encroaches upon the pelvic organs, there are bearing-down pains in the back, sacral (less often sciatic) neuralgia, with pressure on the rectum leading to obstinate constipation, proctitis, hemorrhoids, etc. Defecation is rendered difficult, and is followed by distressing tenesmus. Pressure on the neck of the bladder leads to

frequent micturition, vesical tenesmus, or dysuria. Cystitis may develop from the retention of urine. Since compression of the ureter is nearly always unilateral (except rarely with double malignant tumors), hydro-nephrosis may develop without being suspected, as in a case observed by the writer. Diminution in the amount of urine, lumbar pain, or (in case of disease of the opposite kidney) uræmic symptoms may show the serious effects of such compression. The reader should bear in mind that such marked disturbances are most common in the case of tumors that have become impacted within the pelvis in consequence of one or more attacks of peritonitis. This is peculiarly true of dermoids, which are generally attended with more pain than any other class of tumors, even malignant. Reference has been made to the results of pressure on the intra-pelvic veins,—œdema of the vulva and lower limbs, distress in walking, etc. In general, it may be said that the presence of the pressure-symptoms mentioned should at once arouse the suspicion that an intra-pelvic tumor exists, though this may be a fibroid or a retroverted pregnant uterus instead of an ovarian neoplasm.

The element of pain in connection with ovarian tumors is a variable one, being dependent less on the growth itself than on the accompanying peritonitis. This is noted in cases of cancer, where the pelvic organs have become matted together from repeated inflammatory attacks. The pain is then more of a dull ache than the spasmodic, lancinating pains which are popularly supposed to be pathognomonic of malignant disease. Severe abdominal pain in this connection may be regarded as evidence that the peritoneum is extensively involved. On the other hand, the early development of ascites in connection with cancerous and papillary deposits seems to retard (though it does not prevent, as some writers affirm) the formation of adhesions, and thus there may be a notable absence of pain, even towards the end of life. Extensive intestinal adhesions may exist without causing either severe pain or any evidence of interference with normal peristalsis, but the writer has noted most agonizing colicky pains in connection with circumscribed adhesions of the small intestine ; in fact, these are apt to occur more often than when a considerable length of the gut is anchored to the cyst or abdominal wall. Fibro-myomata and spindle-celled sarcomata with long pedicles, which move freely with changes in the patient's position, may cause severe pain by rolling from one side of the abdomen to the other as she turns in bed. Unless these are sessile and cause pressure-symptoms, they, however, rarely cause much discomfort, except from the accompanying ascites.

The principal discomfort caused during the abdominal stage of an uncomplicated multilocular cyst is the feeling of weight and distention, associated with gastric irritability and interference with breathing. As time goes on, even though the tumor is apparently stationary, the patient's nutrition becomes seriously impaired, as shown by progressive emaciation and feeble heart-action. The urine becomes scanty and concentrated, and

may contain albumin and casts; food is no longer retained; dyspnœa becomes extreme, so that the patient is unable to lie down, and can obtain only occasional snatches of sleep. Even when sitting, the weight of the tumor, as it rests on her swollen limbs, renders this position unbearable. Icterus may result from disturbance of the portal circulation and pressure on the biliary duct. The skin, especially over the abdomen, is dry, and is often the seat of eruptions which add to the sufferer's distress. The "ovarian facies," which has been so graphically described by Sir Spencer Wells, is simply an evidence of the general emaciation plus the expression of anxiety and suffering seen in other wasting diseases. A patient with malignant disease may present a somewhat similar appearance, though it appears earlier. It is impossible to describe either satisfactorily, or to define the delicate shades of difference between them; their recognition is entirely a matter of experience. Towards the end of life the patient develops hectic, the pulse becomes more rapid and feeble, and, if not relieved, she sinks into a typhoid condition and dies from exhaustion, provided that some intercurrent complication does not hasten the fatal termination. This picture (though, happily, the original is rarely seen now) is not an exaggerated one, since the writer has recently observed a case of many years' standing which presented almost an exact counterpart. That the symptoms were entirely due to the presence of the tumor, and that even under these conditions such patients are not beyond the reach of surgery, was shown by the complete transformation of this patient within a month after ovariotomy had been performed.

It is important for the reader to be able to recognize promptly the symptoms of these accidental changes in ovarian tumors, which have been described at length. Acute inflammation and suppuration of the sac are denoted by the sudden development of localized pain and tenderness, with a rapid pulse and elevation of temperature (with or without an initial chill) ranging from 100° to 101° F. in the morning to 103° or 105° F. in the evening, sweating,—in short, the ordinary symptoms of septic infection. General peritonitis may develop, when the case soon terminates fatally; or, if the tumor is intra-pelvic, adhesions may shut off the inflammatory focus from the general cavity, when the symptoms are those of ordinary pelvic peritonitis. Provided that the pus does not find an outlet, the symptoms of septicæmia may persist for weeks, the patient has the usual diarrhœa, and eventually dies of exhaustion. Fortunately, rupture into the peritoneal cavity is usually prevented by dense adhesions, so that the sac empties into the bowel (especially the rectum, in the case of dermoids), less often into the vagina or bladder, this accident being recognized by the sudden discharge of pus, bones, hair, etc. Cases have been reported in which the pus has made its way through the abdominal wall either at the umbilicus or in the groin. The subsequent history of these patients is a miserable one. Rarely the sac may be entirely emptied and may be obliterated by granulation, but, as a rule, irregular discharges of pus or

dermoid contents occur, sometimes during defecation, the sac alternately filling and collapsing, until after the lapse of months the patient succumbs from exhaustion or dies during an acute attack of septicæmia. The case is different when the sac communicates with the bladder, when a virulent form of cystitis is occasioned, which eventually leads to fatal pyelitis. If a dermoid cyst communicates with the bladder, calculi are apt to form around the hair, teeth, or bones which find their way into the viscus.

The symptoms of perforation of the cyst-wall, with gradual escape of its contents into the abdominal cavity, vary according to the nature of the fluid. If the latter is non-irritating there may be no clinical evidence of the accident. In the case of papillomatous cysts there may be a low grade of peritonitis, with the gradual development of ascites and increase of pain, but the symptoms are so little characteristic that unless the patient had been under constant observation for a considerable interval, and a marked change in the size and shape of the tumor had been noted, no suspicion of the extension of the papillary growths would be entertained. The only circumstance under which this condition might be reasonably inferred would be the appearance of these phenomena soon after tapping, especially if the cyst was intra-ligamentous or parovarian.

The symptoms of rupture differ according to the amount of fluid discharged, as well as its character. A sudden attack of severe abdominal pain in a patient with an ovarian cyst, following a blow, fall, or unusual effort, is succeeded by a distinct change in the shape and tension of the tumor. If the fluid is non-irritating, the amount of shock may be insignificant, and there may be little, if any, subsequent elevation of temperature. There is increased diuresis, and the cyst gradually enlarges again. Rupture of a colloid or dermoid cyst, as Sutton has stated, is rarely followed by the escape of a large amount of material, as it is too thick to make its way readily through the opening ; consequently there is less noticeable diminution in the size of the tumor, though its shape is usually changed. The amount of shock depends upon the accompanying hemorrhage, which is sometimes quite profuse, and upon the virulence of the fluid. Colloid material is often, though not always, quite irritating, and may promptly set up acute diffuse peritonitis, as evidenced by pain, distention, and the characteristic rapid pulse and elevation of temperature. That the symptoms may be slight was shown in the case of a patient upon whom the writer operated successfully, removing a large multilocular dermoid which must have ruptured several days before. There was intense congestion of the parietal and visceral peritoneum, but only a slight evening rise of temperature, without pain, increased tenderness, or any apparent change in the tumor, though over a pint of pultaceous material was found among the intestines. The patient made an uneventful recovery, though drainage was not employed. The peritonitis following rupture may be localized and of a subacute type, resulting in the formation of adhesions which give rise to more or less constant pain. Reference has been made to the development of ascites in consequence of

the irritation of the peritoneum, also to the engrafting of colloid material. Any one who has seen a case of acute torsion of the pedicle will seldom fail to recognize the accident on another occasion.   In a typical case the patient is suddenly seized with a violent pain in the abdomen (more severe than in rupture), with symptoms of shock, and it may be also of internal hemorrhage.   Vomiting follows, the tumor becomes larger and more tense, and the patient may feel as if she were going to burst.   The writer has been struck with the resemblance of the symptoms to those of accidental hemorrhage into the gravid uterus, there being in both cases a sudden over-distention of a sac from the rapid accumulation of blood.   The shock and actual loss of blood may be fatal.   In some cases the characteristic symptoms of acute intestinal obstruction soon appear.   Peritonitis rapidly develops, and, if it does not soon terminate fatally, destruction of the vitality of the cyst is indicated by the septic symptoms already described. Should the cyst rupture under the increased tension, the patient might die at once from internal hemorrhage.

Gradual torsion of the pedicle is not attended with any marked symptoms by which it could be recognized before operation, unless we accept Doran's suggestion that it may be inferred from the presence of "dull, constant abdominal pains in a patient who keeps in good health and bears a cystic tumor that increases but little, or not at all, in the course of many months or years."   It is obvious that at the present day no intelligent observer would deliberately watch the growth of a tumor for any length of time without settling the diagnosis by an explorative incision. It should be added that the symptoms of axial rotation in the case of solid tumors are less severe than in the cystic variety.   There may be sudden pain, more or less shock, and intestinal obstruction, but the dangers of intra-cystic hemorrhage and rupture are absent.   Œdema and extravasations of blood may cause a sudden increase in its size, and cystic degeneration is a frequent result of torsion of the pedicle.   Localized peritonitis may result, but suppuration would occur only in semi-solid neoplasms of low vitality, such as cysto-sarcomata or cysto-carcinomata.   Ascites may develop in consequence of the interruption of the circulation, or from peritoneal irritation.

DIAGNOSIS.

In considering the question of diagnosis it will be found most convenient to adopt Olshausen's division of all tumors into three classes,—viz., (a) those which are strictly intra-pelvic, (b) those which occupy the lower part of the abdomen, and (c) those which extend to the epigastric region. This is the division which is practically recognized by every gynæcologist, who instinctively, as soon as he notes the size of a tumor, runs over in his mind the possible conditions which might cause a corresponding enlargement.

Small pelvic tumors are not infrequently detected during an ordinary routine gynæcological examination ; in fact, it sometimes happens that one

finds them in patients who have been examined and treated by former physicians. It is always a good plan to make a careful search for a neoplasm in patients who complain of marked pressure-symptoms, such as have been detailed, as well as in cases of prolapse of the uterus without much enlargement of the organ or injury of the pelvic floor. The writer makes it a rule to examine thoroughly every patient under anæsthesia previous to the performance of a minor operation, having on several occasions discovered neoplasms of the ovary which he had before failed to detect. The recognition of a simple cyst the size of a hen's egg in the usual situation behind the broad ligament or at the bottom of Douglas's pouch demands but an elementary knowledge of gynæcological examination. Its lateral position, globular form, peculiar elastic feel, and mobility independent of the uterus are quite characteristic. It is readily pushed upward, and under favorable conditions (in a thin patient, with relaxed abdominal wall) can be mapped out bimanually and its connection with the uterine cornu established. Palpation through the rectum serves to confirm the diagnosis already made. A rectal examination alone may be advisable in the case of young girls. Should the disease be bilateral, the two tumors can be felt on either side, or one may be behind the broad ligament and the other in the cul-de-sac. If it is intra-ligamentous, its position with regard to the uterus will be more strictly lateral, and it cannot be dislodged in either direction. Rarely the tumor will be found anterior to the uterus, though still a little to one side. Küstner has affirmed that dermoid cysts are found in this location more commonly than the simpler variety, and are recognized by the fact that when displaced upward they tend to return to their original position.

When the cyst reaches the size of the fœtal head at term it usually displaces the uterus antero-laterally, so that, if still movable, its separation from the organ can be readily defined. Its size can now be readily appreciated bimanually, and fluctuation is more or less distinct if the fluid is thin. The most exquisite sense of fluctuation is obtained in a thin-walled monolocular cyst. It may be possible at this stage to distinguish either the semi-solid, gelatinous feel of a multilocular colloid cyst, with its irregular outline, or the peculiar doughy sensation communicated to the finger on palpating a thick-walled dermoid. A small fibroma or fibro-sarcoma with a long pedicle is distinguished by its hard, nodular feel, its mobility, and its isolation from the uterus; but such growths, especially if sessile, are usually mistaken for subperitoneal fibroids. The slow growth, the absence of pain, and the good general condition of the patient would be points in favor of a benignant neoplasm. Fibrous tumors are rarely bilateral like cancer, do not form secondary deposits, and ascites is less frequently present. There are, however, cases in which the mere recognition of a solid tumor is alone possible, no hint being obtained as to its character.

When a small cyst is fixed by inflammatory exudate the diagnosis becomes much more difficult, not only because the sensitiveness of the patient

does not permit so thorough an examination, but also because the inflammation leads to thickening of the cyst-wall, obscuring the former fluctuation. The smooth, globular outline of the tumor can no longer be mapped out bimanually, while its adhesion to the uterus or walls of the pelvis may be so firm that its origin from the ovary becomes problematical. If the existence of the tumor was not previously known, the history of an attack of pelvic inflammation might readily lead to the inference that the ill-defined enlargement was an abscess. Should suppuration occur in the cyst, an inference as to its original character would be well-nigh impossible. Under these circumstances an examination under anæsthesia is indispensable to the making of even a probable diagnosis. Although such an examination should be as thorough as possible, it must not be forgotten that the cyst may be ruptured by too rough manipulation when the patient is not in a condition to give the danger-signal. When the muscles are completely relaxed by ether it will often be found that a cyst which was supposed to be adherent is simply impacted in the pelvis and can be pushed up readily, or one which was thought to be absolutely fixed will have a certain range of motion, so that its separation from the uterus can be made out. The examiner should seek to insinuate his index finger or index and middle fingers into the sulcus between the uterus and the tumor. Provided that the patient is sufficiently thin, he may with the aid of the external hand grasp the entire organ and draw it forward, away from the tumor. Drawing down the uterus with the volsella, in order to decide whether the tumor moves with the uterus or not, is not practised so much now as formerly. It would not give much information in the case of a small cyst firmly adherent to the posterior surface of the uterus. The sound gives little information in such a case; reference will be made to its use in connection with the differential diagnosis.

The importance of fluctuation as an evidence of the presence of a cyst has been overestimated. Even with the patient anæsthetized, the examiner is liable to be deceived, mistaking the doughy feel of a soft fibroid for that of a thick-walled dermoid; conversely, it is a common occurrence to find at the operating-table a simple ovarian cyst (even a thin-walled unilocular one) so buried in exudate as to simulate a fibroma. Explorative puncture is now regarded as a legitimate procedure only in the case of intra-pelvic cysts which the surgeon has good reason to suppose contain fluid. The cautious gynæcologist will not only feel comparatively sure that he has to do with a collection of fluid, but will not thrust his needle into the sac unless it is either adherent in Douglas's pouch or causes a bulging of the posterior vaginal fornix, so that there is no fear of irritating material escaping into the pelvic cavity. A needle of moderate calibre should be used, at least two inches long, the ordinary aspirating-syringe being sufficient, though some prefer a regular aspirator. It is hardly necessary to add that the strictest aseptic precautions should be observed with regard to cleansing the vagina and the instrument. The fluid obtained may be watery, bloody, or purulent. The contents of a dermoid or colloid cyst

can, of course, not be withdrawn through an ordinary needle. The resist-
ance experienced during its passage may furnish a hint as to the solid or
semi-solid consistence of the tumor. If pus is withdrawn, it is an easy
matter to make an incision into the sac at the time and to irrigate and
drain it.

When a tumor has risen out of the pelvis and has attained such pro-
portions as either to cause a visible enlargement of the abdomen, or to
be palpated readily through the abdominal wall, the diagnosis no longer
depends upon the result of the vaginal examination. When consulted
with regard to the nature of such a tumor, the first thing to determine is
whether one really exists. In deciding this important question the physi-
cian must endeavor to be entirely independent, not allowing himself to be
biassed either by the positive statements of the patient or by the opinions
of former examiners. By reviewing the history carefully, he may elicit
facts which will render him suspicious of the existence of a neoplasm, such
as the presence of a strong hysterical element, especially in connection with
the climacteric, a marked tendency to adipose or tympanites, symptoms of
pregnancy, obstinate constipation, etc. His knowledge of human nature
and a previous experience with similar cases will stand him in good stead.

In making a physical examination the patient is placed upon her back
on a table or sofa, with her abdomen entirely exposed and her limbs slightly
flexed, in order to relax the muscles as much as possible. The skirts should
be loosened and the corsets unfastened or, better, removed. As these prepa-
rations are sure to make a timid patient nervous, the examiner should
avoid a brusque, business-like air, and should endeavor to gain her confi-
dence and allay her fears by a few words of encouragement. Gentleness,
either natural or acquired, contributes not a little to the success of the gynæ-
cologist, and is of decided advantage in the class of cases under consideration.

Before touching the abdomen one should inspect it carefully, noting
especially whether it is symmetrical or not, the prominence of the navel,
the presence of equal bulging in the flanks, of prominence of the super-
ficial veins, œdema of the skin, etc. In order to estimate the amount of
sagging of the abdomen it may be well to have the patient sit on the edge
of the table, or even to stand erect, when a practised eye will often detect
the contour presented by excess of adipose, ascites, or pregnancy. At the
same time the general aspect of the patient, especially as to the development
of fat, should be noted. (Compare Figs. 34–37, ante, pp. 61 and 62.)

In the case of a stout woman, whose symptoms indicate the presence
of the climacteric, it is well to begin our manipulations by picking up the
abdominal wall and rolling it between the thumb and fingers in order to
estimate its thickness. If the wall is sufficiently relaxed, we may draw the
fold strongly forward and palpate deeply *beneath* it over the site of the
supposed tumor. Additional information may be gained by having the
patient sit up, when the fatty folds are brought out more distinctly. The
examiner then touches the entire abdomen with one hand, noting the gen-

eral doughy feel, instead of the peculiar resistance offered by a tumor.   He then palpates with both hands, first together and then on opposite sides of the abdomen, observing the ordinary surgical rule *not* to palpate in the long axes of muscles.   The pseudo-fluctuation in a fat subject may be easily mistaken by the experienced for the sensation given by cyst-fluid.   In case of doubt, compare it with the thigh, where the same phenomenon will be noted.   Note that the wave is not transmitted from one side of the abdomen to the other, especially if, as Goodell suggests, an assistant " muffles this fat-thrill" by pressing upon the abdomen between the hands of the examiner. Finally, percuss strongly, sinking the hand deeply into the wall, when uniform resonance will be noted instead of the flatness which marks the presence of a neoplasm.   The vaginal examination will be negative as regards

FIG. 31.
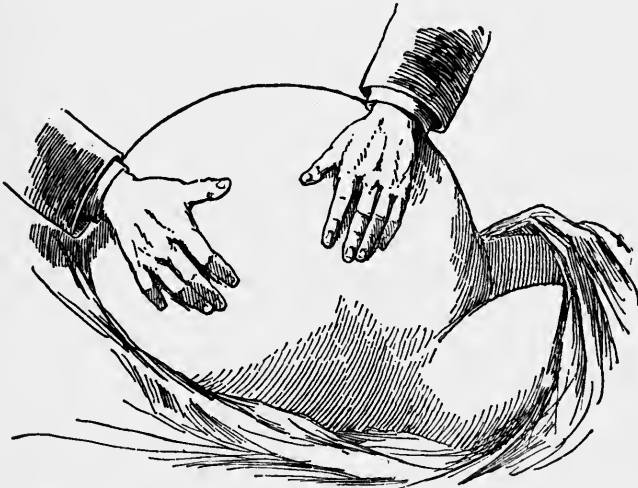
Palpating the abdomen in a case of ovarian cyst. (More Madden.)

the detection of any intra-pelvic tumor, though in a very stout patient the bimanual will, of course, be unsatisfactory.

Under these circumstances, and in the absence of pressure-symptoms and other signs of an ovarian cyst, the practitioner can be reasonably certain that the patient has been deceived.   However, if, from the thickness or resistance of the abdominal wall and the nervousness of the subject, he has been unable to obtain positive evidence as to the absence of a tumor, it will be wiser for him not to hazard an opinion until he has made an examination under anæsthesia, especially if a former examiner has not only asserted that a tumor is present, but has even proposed an operation.   A small growth *may* exist, though it does not cause the uniform enlargement which the patient has mistaken for one.   The confidence with which the physician expresses his opinion must be determined by his experience.

The same class of patients (women at the climacteric) are commonly troubled with tympanitic distention of the intestines, which leads them to

believe that they have a tumor.   Their attention is first attracted to it by
the fact that their clothing is uncomfortably tight.   Careful questioning
elicits the fact that the swelling is not permanent, but "comes and goes,"
being usually most marked a little while after eating.   They are much
troubled with rumbling of the bowels, eructations of gas, and flatulence,
often with colicky pains.   The "tumor," when first noticed, was not
unilateral, but appeared in the hypogastrium.   The examination of these
patients is usually rendered difficult by the fact that they have a thick
deposit of adipose as well as tympanitic distention.   Inspection is often
misleading, since the abdomen may present a globular swelling such as we
are accustomed to associate with a tumor.   Palpation furnishes contrary
evidence, as before, while percussion gives a uniform resonant note.   On
auscultation, the gurgling produced by gas in the intestines will be heard.
These patients are usually hyperæsthetic, but deep percussion will furnish
conclusive evidence in spite of their resistance.   So-called "phantom
tumors" in young hysterical women may be exceedingly puzzling, whether
due to tympanites or to tonic spasm of the abdominal muscles, especially
as the attendant may be thrown off his guard by the patient's plausible
history.   The necessity for a thorough examination under ether is evident,
especially as the condition has been observed in women with ovarian or
uterine tumors, as well as in pregnancy.   Œdema of the abdominal wall
has been mistaken by the patient for a neoplasm, but no physician should
fall into this error, since he will not only recognize the ordinary pitting on
pressure, but will find a cause for the phenomenon.   It has been noted as
a late accompaniment of abdominal tumors.

Having reviewed briefly the common sources of error in deciding as to
the existence of an abdominal tumor, we shall next consider the ordinary
physical signs presented by an ovarian cyst, first, when it occupies the lower
part of the abdomen, and, second, when it extends to the epigastric region.
The diagnosis may be quite easy,—as Sutton remarks, "more certain than
most things in clinical medicine,"—or it may be simply impossible unless
the abdomen is opened.   The principal difficulties in the way are a doubt-
ful history, thick or resistant abdominal walls, and the presence of the
various complications before mentioned, especially adhesions, ascites, and
other tumors.

An uncomplicated ovarian cyst of moderate dimensions (the size of a
man's head) usually causes, especially in a thin subject, a distinct bulging
in one flank, which the patient has herself noticed.   On palpation, its
globular outline is readily made out, its borders being defined with the
fingers, except below, where it is lost in the pelvis.   It has a firm, elastic
feel which to the expert is quite characteristic, though, in the words of
Tait, this sense of resistance "it is quite impossible to teach."   Fluctuation
may or may not be present.   In a unilocular cyst, or in the large cavity of
a multilocular one with thin walls, especially if the abdominal wall is not
too thick, an exquisite wave may be felt by tapping with the finger on the

inner side of the cyst while the hand is placed over its outer side. Its surface is either smooth or nodular. It will be found to extend over to the median line of the abdomen, or past it. On manipulating the tumor, it will be found to have a certain range of mobility, sometimes enough to be appreciated by the patient, who feels it roll over to the opposite side as she turns in bed.

On percussion, there is dulness over the tumor, with tympanitic resonance above and laterally, there being no change in the area of dulness as the patient is turned alternately on one side and the other, unless the tumor is so movable as to gravitate to the dependent side. Auscultation furnishes no additional evidence, an occasional bruit being the only adventitious sound heard over the tumor.

On making a vaginal examination it may be impossible to feel the cyst; if a portion is still intra-pelvic, the presence of a short pedicle or adhesions may be inferred. The uterus, of normal size or only moderately enlarged, will be felt, either ante- or retroverted, more often in the latter position. Not infrequently the entire organ is drawn upward with the vagina, when the fundus can be felt above the symphysis in contact with the abdominal wall; it will usually be pushed over to the opposite side of the pelvis by the growth. It is unnecessary to use the sound in these cases. The examiner should note how much, if any, motion is communicated to the organ while manipulating the tumor, as he can thus gain some idea as to the length of the pedicle. Palpation of the other ovary should always be attempted, since a second incipient cyst may be discovered. A rectal examination will settle the position of the uterus in case of doubt.

A large abdominal tumor of ovarian origin presents certain physical peculiarities which should be carefully noted, as they will be referred to again in connection with the subject of differential diagnosis. The abdomen is uniformly enlarged, but is most protuberant in the region of the umbilicus; the latter may be flattened as in pregnancy, or protrudes if hernia is present. It may present an irregular outline, the bulging being more marked in one flank than in the other. On deep inspiration a downward movement may be observed in the tumor. Dilatation of the superficial veins is not pathognomonic; the *lineæ albicantes*, commonly observed in pregnancy, may be well marked. The difference in symmetry between the physiological and the pathological condition will be shown by measuring the distance from the umbilicus to each anterior superior iliac spine. The upper limit of the growth can be made out by palpation, while below it is not to be separated from the pelvis. Its lateral borders are now not clearly defined. The peculiar elastic feel of the tumor is readily appreciated, while deep fluctuation is felt with more or less distinctness. It is often possible in the case of a colloid cyst to make out not only the location of the large sac, but the presence of secondary cysts of different consistence. Percussion furnishes the same results as before, the transverse colon, which now lies just above the tumor, giving tympanitic resonance in this region. As

the tumor continues to grow it may be no longer possible to define its upper border, which lies beneath the ribs, so that a certain amount of tympanitic resonance is obtained only at the sides, and may be lost even there as the neoplasm, unable to grow any farther in an upward direction, spreads out laterally, the shape of the abdomen being changed accordingly. The ribs and sternum are bent outward, and the belly becomes more pendulous. Percussion over the stomach, liver, and spleen shows that these organs are displaced upward, while examination of the thoracic viscera indicates the pressure to which they are subjected from below. The facies and general condition of the patient present the appearance already described at this advanced stage.

While modern surgeons attach less importance to the refinements of diagnosis than did those of a former generation, not only because experience has shown that few, if any, of the clinical signs which have been described are absolutely reliable, but also because the question of prognosis has been essentially modified by improvements in operative technique, it is not well for the practitioner to be content with the mere recognition of a large ovarian tumor. He should at least try to find out all that can be learned about its character and environment before opening the abdomen. He may, with more or less success, gain by a physical examination some information as to whether it is solid or cystic, benign or malignant, single or double, slightly or firmly adherent. At the same time a careful examination will show if the patient has visceral complications which may affect her chances of recovery from an operation. Solid tumors rarely reach so large a size as to fill the entire abdomen. Such a growth of moderate size may be recognized by its greater firmness and the absence of elasticity and fluctuation. With a thin, relaxed abdominal wall it may be possible to make an accurate diagnosis, but experts are frequently deceived, since a thick-walled colloid cyst may readily be mistaken for a solid tumor. Rapid growth, the early development of ascites, and progressive depreciation of the general health, point to its probable malignant character, the suspicion being strengthened by the detection of secondary nodules in the omentum and peritoneum and by the condition found by vaginal examination. Cysto-sarcoma and cysto-carcinoma may present the same physical conditions as an ordinary multilocular cyst, but the accompanying conditions denote a more malignant process. The same symptoms may be produced by an ordinary cyst that has undergone malignant degeneration, but ascites is apt to develop later under the latter conditions. If a cyst which has existed for some time without causing serious symptoms begins to grow rapidly, or if the patient's health declines more quickly than would be explicable by the mere presence of the tumor, a malignant change may be reasonably inferred.

Double cysts may be recognized while they are still of moderate size, but when they fill the abdomen, and especially when they are fused together, it is impossible; nor is the diagnosis a matter of any practical importance.

The side from which the cyst sprang is often inferred from the history, the displacement of the uterus, the position of the intestines, the greater prominence of the affected side, and the position of the pedicle. These signs are manifestly wanting in the case of a tumor that fills the abdomen. Surgeons pay little or no attention to this point.

The determination whether a cyst is unilocular or multilocular, papillary, dermoid, or multilocular dermoid, is sometimes possible. Thus, a smooth, uniform tumor in which fluctuation is the same at every point, the wave being easily transmitted from one side to the other on slight tapping with the fingers, is either a unilocular cyst containing a thin fluid, or an oligocystic tumor with a large cavity. The slow growth of the latter is a point in favor of the diagnosis. The difference between thin and gelatinous contents is better appreciated when the cyst-wall is relaxed than when it is tense.

A multilocular cyst may be recognized by its size (since it attains the largest dimensions of any ovarian tumors), irregularity, semi-solid consistence, and the fact that fluctuation, if present, is limited to a certain area. Under favorable conditions a peculiar vibration may be felt, such as would be given by the agitation of a quantity of jelly. Secondary cysts are sometimes felt as detached masses, or give the impression of being pedunculated like a group of subperitoneal uterine fibroids. Under these circumstances they may be mistaken for cancerous nodules in a collection of ascitic fluid, especially if symptoms are present which seem to suggest malignant disease.

The positive recognition of true papillomatous cysts is seldom possible. Certain anatomical peculiarities should be borne in mind, such as their moderate size, the frequency with which they are bilateral, their relatively rapid growth, without other evidences of malignancy, and the development of ascites, not early, but after they have existed for some time. On palpation they give the sensation of being semi-solid, in spite of their thin fluid. On the other hand, a cyst has often been diagnosed as unilocular the principal cavity of which contained numerous secondary cysts and papillary outgrowths too small to affect the wave of fluctuation. The prediction that a multilocular cyst contains such masses is always unsafe, since its semi-solid feel may be due to secondary cysts with thick colloid contents. The inference that the sac contains pus or blood is usually impossible, even when the history points to probable axial rotation or acute inflammation. This doubt, as well as the impossibility of determining that an apparently simple cyst is not papillomatous, furnishes a forcible argument against explorative puncture.

Reference has already been made to the diagnosis of intra-pelvic dermoid cysts. Pure dermoids seldom exceed the "second stage" of development. Their slow growth, especially in a young subject, frequent complication with peritonitis, and the unusual amount of pain accompanying them are by some writers regarded as characteristic. As a rule, their true character is recognized only at the operating-table, or when they per-

forate into and discharge their contents through one of the mucous canals. On palpation they give an obscure doughy sensation different from that of a colloid tumor, and exceptionally it is possible to feel a tooth or a bony nodule in the cyst-wall. That the latter is by no means a positive sign is shown by reports of cases in which calcareous plates on the exterior of simple cysts, or the bones in ectopic sacs, have been mistaken for dermoid contents. Multilocular dermoids are seldom recognized as such before opening the abdomen, since the dermoid loculi are relatively small and are masked by the general colloid character of the tumor. Under exceptionally favorable conditions, as in a thin patient, where the dermoid portion is in contact with the abdominal wall, its doughy feel and the presence of bones might furnish a sufficient contrast to the other portions of the tumor to suggest the complex nature of the growth. Its rapid growth and large size would render it certain that it was at least not a pure dermoid. A good deal of attention was formerly bestowed upon the diagnosis of adhesions, which were an object of peculiar dread to the ovariotomist. Many now go to the opposite extreme, and affirm a profound scepticism with regard to the possibility of recognizing them before operation. There is no doubt that increased experience renders one distrustful of his ability to predict either their presence or their absence. The reader's time will not be taken up with refinements of diagnosis, but it is important that he should learn to apply certain rules for the detection of the more obvious adhesions on account of their bearing on the question of prognosis, always being prepared to find at the operating-table that he has been entirely mistaken in his inferences.

The method of recognizing the fact of the fixation of intra-pelvic neoplasms has already been outlined. In the case of a medium-sized abdominal tumor the history of a former attack of peritonitis, with tenderness on moderate pressure and limited mobility (or entire absence of the same) on manipulation, indicates the probable existence of adhesions. The suspicion is strengthened if the growth remains unilateral, not developing in the usual way towards the median line. Firm attachments to the abdominal wall can be made out when the latter is quite thin and relaxed and there is not too much local sensitiveness to prevent free manipulation of the tumor. A history of previous tapping would help to support the diagnosis. The presence of crepitation on rolling the tissues over the surface of the tumor is not pathognomonic of recent adhesions, since the same sensation may be caused by nodules or calcareous plates on its exterior. The supposed independent movement of the parietal and visceral serous membranes may be deceptive. Moreover, apparent fixation of the dependent portion of the tumor within the pelvis may be due to a short pedicle.

In the case of a large tumor of long standing it may usually be assumed that parietal adhesions are present, though subjective symptoms are absent. The exceptions are few, but the pseudo-membranes may be limited and filamentary. Clinically, the presence of free peritoneal fluid is no evidence

that general adhesions do not exist. Occasionally a layer of ascitic fluid is detected between the tumor (especially if it is solid) and the abdominal wall by practising gentle palpation with the finger-tips. Olshausen has called attention to the fact that when the fluctuation is no longer transmitted freely across the abdomen, but is confined to isolated spots over the tumor, it is an indication that the fluid is confined in interstices of the pseudo-membranes. Fixation of the neoplasm may be inferred when by inspection or percussion it shows no downward movement on deep inspiration ; but thickness of the abdominal wall may easily obscure this sign.

The presence of visceral (especially intestinal) adhesions may be suspected from a history of obstinate constipation and severe colicky pains, from the intimate relation of a coil of intestine to the cyst, and especially from the discharge of cyst-contents per rectum. Exceptionally a loop of gut may lie in front of the tumor, where, in a favorable subject, its presence might be recognized by the localized tympanitic note on percussion. It may be safely assumed that a tumor fixed within the pelvis is covered by a layer of adherent gut, though we question if many examiners possess Winckel's ability to palpate the coils per rectum.   It is doubtful if adhesion of the omentum to the anterior surface of a cyst can be recognized before operation, unless under the exceptional circumstances referred to by some writers when there exists at the same time a large umbilical hernia. Vaginal palpation enables one to demonstrate the relations of the intra-pelvic portion of an abdominal tumor, though the question of its fixation is generally doubtful, as it is so impacted by reason of the superincumbent weight that it may not share in the movement imparted to the main tumor. Upward dislocation of the uterus is not a positive sign of its close attachment to the growth, and, on the other hand, the retroverted organ may be rendered immovable purely by the pressure of the neoplasm. The length of the pedicle makes considerable difference in this respect. It is well to remember that the bladder is occasionally drawn upward and attached to the anterior surface of the tumor so as to be in danger when ·the abdominal incision is made. The passage of a catheter will readily establish this point and put the surgeon on his guard, though the experienced operator never loses sight of this possible complication. The coexistence of uterine with ovarian tumors may render the diagnosis quite difficult, especially if these are fused together by inflammatory exudate, or if free peritoneal fluid is also present. The differential diagnosis will be discussed in the following section. In arriving at a conclusion the physician should pay particular attention to the menstrual history, and note the size of the uterus and its relations to the suspected fibroids. The difference in density between a hard uterine fibroid and an ovarian cyst is readily appreciable to the practised touch, but the coexistence of solid growths of both organs cannot be made out with any degree of probability. These are cases in which an explorative incision is clearly indicated.

The diagnosis of early pregnancy in a patient with an ovarian tumor

presents no especial difficulties, provided that the history is clear and that the previous existence of the growth is known. But when she consults the physician for the first time his attention is apt to be so concentrated on the neoplasm that he forgets the possibility of an accompanying physiological condition. If, from her age, her irregular menstrual history, and the absence of the ordinary subjective symptoms, the possibility of pregnancy seems doubtful, the most experienced may err, especially if the uterus is so displaced or masked by the tumor that it cannot be clearly mapped out bimanually. Retroversion of the pregnant uterus plus an impacted cyst constitutes a puzzling combination. When both the uterine and the ovarian tumor have slipped out of the pelvis, not only do they cause a peculiar broadening of the lower part of the abdomen different from that due to either enlargement alone, but the limits of the two tumors can be defined, with a well-marked depression between them. The latter sign, as well as independent mobility of the cyst, is wanting when the latter is adherent to the uterus. However, it will be noted that one tumor is continuous with the portio, while the other is not. If the uterus is dislocated upward, the results of the vaginal examination (internal ballottement, etc.) may be negative. As pregnancy advances, external ballottement and fœtal movements and heart-sounds will serve to establish the diagnosis, aside from the difference in the rate of growth in the two tumors, the symmetrical contour of the one and the irregular form of the other. It need hardly be added that in a case of this kind, in which an exact diagnosis is so important, the practitioner should keep the patient under careful observation, noting carefully any change in the condition of affairs, and should share the responsibility with a more experienced *confrère*. Delay of a few weeks during the early period of pregnancy is advisable in order to make sure of the progressive enlargement of the uterus, but during the latter half it may subject the patient to too great a risk. It should not be forgotten that tubal gestation may occur in a woman with an ovarian tumor, as will be discussed later. In short, it is possible for cysts to coexist with neoplasms of abdominal as well as of pelvic origin, as shown by the complicated conditions daily encountered in the operating-room.

The duty of the surgeon is by no means fulfilled when he has exhausted all the means of arriving at a conclusion regarding the character of an abdominal tumor and the presence of local complications. A general survey of the patient should be made in order to determine if she is suffering from any organic visceral trouble. It is not necessary to describe the ordinary routine practice of the careful diagnostician, except to add that the examination should be *thorough*, in view of its direct bearing on surgical treatment. The question of indications and contra-indications will be discussed elsewhere. Suffice it to say that there is ample room for the exercise of the highest skill and acumen in deciding how far an ominous sign is to be interpreted as due to an independent lesion of an organ, and how far to the presence of the neoplasm, or to what extent a pre-existing

trouble is aggravated by the growing tumor. The condition of the heart and kidneys should receive the keenest scrutiny, as it is to complications in these organs that the majority of the non-preventable deaths after ovariotomy are due. Other things being equal, the most successful surgeon is he who is most thorough in this respect. In a doubtful case a single examination is not sufficient to determine these points. The patient must be kept under careful observation for several days, preferably in a hospital, where she can be under constant surveillance. Serious cardiac and renal complications have been entirely overlooked by a too prompt operator impelled by one of the strongest motives to haste in this age of competition,—the fear of losing a good case.

DIFFERENTIAL DIAGNOSIS.

Sutton remarks emphatically that "there is no organ in the belly, except the supra-renal capsule, which has not at some time or other given rise to signs resembling those presented by an ovarian cyst." When we add to this the fact that the exact origin of a tumor can sometimes not be determined even after the abdomen is opened, the reader will infer that the subject is a somewhat broad one. But it will be evident as we proceed that the same process of elimination is followed as in any other branch of medicine, and that, however great may be the number of conditions which we may assume to be present, they can be rapidly narrowed down to two or three by dismissing such as are, from the history and results of the physical examination, manifestly improbable. Instead of trying to recall indiscriminately the score of different causes of abdominal enlargement enumerated in the text-books, the beginner should accustom himself to a certain routine, when he will be surprised to find how much simpler the matter is than he had at first supposed. The writer's practice is to divide all tumors into two classes,—those which originate in the pelvis, or, more broadly, below the umbilicus, and grow upward, and those which spring from the upper half of the abdomen and grow downward. A second subdivision into lateral and median tumors then suggests itself, when the mind at once reverts to the tissues or organs in the given locality from which it might develop. It will be found that this rule is practicable even in the case of neoplasms that are apparently quite symmetrical and fill the entire abdomen, so that at first sight it appears impossible to assign them to either class. Before entering upon this subject it is important to consider at some length a condition which may be mistaken for the presence of an ovarian cyst.

There ought to be no difficulty in distinguishing between ovarian cyst and a dropsical effusion due to general causes, such as chronic disease of the heart, lungs, or kidneys, or even to a depraved state of the blood, since the history of the case and the fact that the patient has been for some time under observation should prevent error. The history of a large cyst may extend over many years. That it is possible to overlook so obvious a

cause has been impressed upon the writer by his seeing abdominal sec-
tion performed by prominent gynæcologists, who found, to their dismay,
not the supposed ovarian cyst, but (as shown by autopsy) in one instance
cirrhosis of the liver and in another contracted kidneys, while in a third
the true cause of the effusion could not be determined.   The simultaneous
occurrence of œdema of the lower limbs (a rare and late complication
of ovarian tumor) should lead the practitioner to make a thorough search
for some visceral lesion.   More puzzling are those cases in which hydro-
peritoneum is due to local causes, such as subacute or chronic peritonitis
(especially tuberculous), obstruction of the portal circulation, or malignant
disease, especially the latter, when the effusion occurs so · rapidly as to
obscure the original condition.   It may be said that there is nothing which
tests a man's general medical knowledge so thoroughly as an investigation
of the causes of ascites.   He who has not enjoyed the advantages of a
careful training in physical examination will find that the proper study of
a single case furnishes invaluable mental discipline.

Assuming that the history gives no positive clue to the true condition
in a patient seen for the first time, the practitioner must enter upon the
examination with his mind as unbiassed as possible.   For obvious reasons,
the greatest difficulty will be experienced in deciding between extensive
ascites and a cyst which fills the abdomen, since with a smaller tumor or
a moderate amount of effusion the peculiar characteristics of each are more
apparent.

In a patient with ascites it will be noted on inspection of the abdomen
that it is enlarged symmetrically, but is somewhat flattened, not showing
the prominent swelling seen in ovarian cyst, while there is a marked
bulging laterally.   The lower ribs are not bent outward as in the case of
a large tumor.   The motion imparted to the la·ter on deep inspiration is
wanting.   Turning the patient upon her side, the free fluid will gravitate
accordingly, causing a change of form which is not seen in the case of a
cyst.   With the patient in the sitting posture, the difference in the shape
of the abdomen will also be apparent.   To the initiated, simple palpation
will at once reveal the absence of that resistance peculiar to a multilocular
cyst, though a large, thin-walled oligocystic tumor may present precisely
the same sensations to the fingers.   In a favorable case a visible super-
ficial wave of fluctuation may be observed following a light tap, and will
be clearly appreciated by the hand placed on the opposite side of the
abdomen.   In a cyst, even when its borders cannot be clearly defined,
fluctuation is limited to the cyst-area, may be more distinct in the upper
portion of the tumor than in the lower, and is absent in the semi-solid
portions.   Comparing the results of percussion, the fluctuation in ascites
is not confined to the dull area.

The distinguishing characteristic of ascites is a tympanitic percussion-
note in the region of the umbilicus, with dulness in the flanks, the reverse
being true in the case of a cyst, except in rare cases in which the latter

contains gas by reason of its communication with the intestine. In some cases in which the tympanitic note is not appreciated, Wells has suggested placing a pillow under the patient's hips, in order to cause the fluid to gravitate towards the diaphragm, when the intestines will float upward. Change in position brings out a change in resonance varying with the level of the fluid. This is best appreciated when it is not present in excess. Thus, its upper level can be mapped out when the patient is sitting, and when she is turned alternately on one side and the other a tympanitic note will be heard over the upper flank. Deep pressure and strong percussion may be required in the case of a patient with a thick abdominal wall, or where the latter is so distended with fluid that the intestines lie some dis-

FIG. 32.
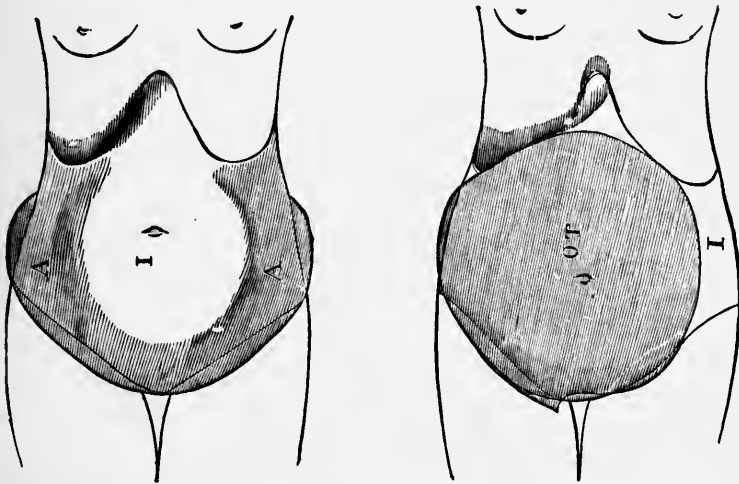
Area of dulness in ascites and ovarian cysts. (Barnes.)—*A*, ascitic dulness; *I*, intestinal resonance; *OT*, dull area of ovarian tumor; *I*, intestinal resonance.

tance behind it. The characteristic signs may be absent when the omentum is greatly thickened by cancerous or tuberculous deposits, fat, etc., or where the intestines are generally adherent. Here the examiner must rely upon the sensation of fluctuation and the variations noted on change of position. A vaginal examination often throws considerable light upon the diagnosis, for while in ascites the pelvic organs are often normal, the uterus being in its proper position and freely movable, with an ovarian cyst it is apt to be either retroverted or drawn upward. The bulging of the posterior vaginal fornix by free fluid in the pelvis gives an entirely different sensation from a cystic tumor, while the wave of fluctuation transmitted from above is much more distinct. When the pelvic organs are entirely shut off from the abdominal cavity by inflammatory exudate, this evidence is, of course, wanting.

Sometimes a collection of ascitic fluid is confined by adhesions, causing a circumscribed enlargement which may readily be mistaken for an ovarian

cyst. There is a history of an acute or a subacute peritonitis (which is nearly always tuberculous), with corresponding impairment of the health and often persistent localized pain. The abdomen is not prominent. The tumor, the boundaries of which are ill defined, is fixed among the intestines, so that fluctuation is limited and the percussion-note is dull in front, as in the case of an ovarian cyst, there being also no variation with change in position. It is most often found in the middle of the abdomen rather than at one side. Vaginal examination is negative as regards the detection of a tumor or a fluctuation. It is evident that a diagnosis is often impossible without the aid of an explorative incision. The writer was once completely deceived in a case of tuberculous peritonitis which gave all the physical signs of a typical multilocular cyst, the semi-solid portion being a mass of thickened omentum, while the supposed main cyst was a collection of ascitic fluid among the adherent coils of intestine.

The association of ascites with an abdominal neoplasm at once raises the question whether the latter is of ovarian origin. If the tumor is large and there is only a moderate amount of ascitic fluid, an application of the usual method of palpation and percussion will enable the examiner to map out the tumor, and to distinguish the deep elastic feel, or fluctuation, in the latter from the superficial wave obtained by tapping on the opposite side of the abdomen. Should the tumor be deep-seated, alternate light and firm pressure will bring out the delicate shades of difference. With double cysts the diagnosis will be more difficult. In the case of solid growths of medium size, especially if these are bilateral, the suspicion of malignancy will be aroused by the history of rapid growth and serous exudation, cachexia, and especially the detection of secondary nodules in the omentum and peritoneum.

It will be remembered that ascites may accompany small fibrous tumors. Its association with a small cyst in a patient in good health usually suggests the papillary variety, while its gradual development in connection with a multilocular tumor may follow perforation. It would rarely be possible to distinguish cyst-fluid in the peritoneal cavity from the ordinary exudation, unless a sufficient quantity had escaped to allow of comparison with the cyst. Olshausen has described a peculiar crepitus imparted to the palpating finger by colloid material in the peritoneal cavity.

When the tumor is small and the abdomen is much distended with ascitic fluid, the neoplasm may be completely masked. Under these circumstances, when the general causes of hydroperitoneum have been eliminated, the vaginal examination is negative and the practitioner suspects a local cause, and, if his leanings are surgical, he begins to think of the propriety of making an explorative incision. Before proceeding so far he should ask himself whether it may not be better first to withdraw some of the fluid. The value of explorative puncture as a means of diagnosis has doubtless been greatly overrated, but that does not prove that the careful observations of our more cautious predecessors should be dismissed as

entirely valueless. It is true that few abdominal surgeons would hesitate before making an explorative incision in a doubtful case because of the result of the chemical and microscopical examination of a drachm of fluid withdrawn by the hypodermic syringe. On the other hand, the withdrawal of a few pints of free fluid may clear up the diagnosis most satisfactorily, especially where malignant disease is suspected. The writer, though opposed to the practice of tapping ovarian cysts, has frequently resorted to the aspirator under the above circumstances, and never with any bad results, though he has always been prepared to operate promptly if it seemed necessary. Although in several instances the fluid was found to be ovarian instead of dropsical, the patient was none the worse for the puncture. At the same time the possible dangers of puncture, even when a small needle is inserted to a slight depth, should not be lost sight of. An adherent loop of gut or superficial vessel may be punctured, septic fluid may escape from a cyst, a vascular solid tumor may be wounded: all of these accidents have occurred. Yet these can nearly always be avoided by proper care in the selection of the point of puncture, and by remembering that, since the object is merely to remove the excess of free fluid, the needle need not be introduced so deeply as to reach the neoplasm. The purpose of the operation may be defeated through blocking of the needle by lymph or a thick fluid. Ascitic fluid is of a yellowish or greenish color, frequently bloody, has a specific gravity seldom above 1015, and contains a considerable amount of albumin, but no paralbumin.

Fig. 33.

Sprouting cell-groups in ascitic fluid: malignant disease of ovary and peritoneum.

The viscidity noted even in thin cyst-fluids is absent. It coagulates spontaneously, and, when examined microscopically, contains few, if any, of the cell-elements so common in the contents of ovarian cysts. It is evident that the fluid from a parovarian cyst, when mixed with blood, might present the same peculiarities. Of more diagnostic value are the "sprouting

cell-groups" described by Foulis, the presence of which in free peritoneal fluid the writer still believes (in spite of the positive contrary assertions of some observers) to render highly probable the existence of malignant or papillomatous growths in the peritoneum.   Figure 33 represents the actual appearances observed under the microscope in a drop of ascitic fluid removed from a doubtful case of the writer's, in which the diagnosis of cancer was confirmed by an explorative incision.   A similar diagnosis, based on the same grounds, was made in several other instances, each time correctly.   While the absence of these cells is by no means an argument against the presence of malignant disease, the writer's personal experience has led him to believe that they possess considerable diagnostic value,—an opinion recently expressed by so accurate an observer as Osler.

Echinococcus hooklets and scolices are sometimes found in ascitic fluid where the existence of the parasites had not been suspected.

Any inference as to the rupture of an ovarian cyst from the examination of free fluid would be open to grave doubt, though the finding of numerous "ovarian cells," cholesterin plates, etc., might serve to confirm a diagnosis of ruptured cyst based on other more probable signs.

But, as before stated, the most useful application of explorative puncture lies in the removal of a sufficient amount of fluid to enable the observer to unmask tumors and secondary nodules, to the differentiation of which he can then proceed according to the usual rules, being governed in his decision as to the performance of explorative cœliotomy by the presence or absence of advanced malignant disease and the condition of the patient.

The differential diagnosis of intra-pelvic ovarian tumors presents greater difficulties than does that of abdominal growths, since it involves a high degree of cultivation of the *tactus eruditus*.   Several experts examining the same patient not only may receive different impressions with regard to what they feel, but, if they agree as to facts, may interpret them differently, even after they make a thorough examination under anæsthesia, while explorative cœliotomy may prove them all to have been in error.   The pelvic tumors to be distinguished from ovarian are encysted collections of serum, pus, or blood, enlargements of the tube, fibroid tumors of the uterus and broad ligament, retroflexion of the gravid uterus, and last, but not least, ectopic gestation.

Reference has already been made to the difficulty of recognizing the nature of an encysted collection of serum in the abdominal cavity where the symptoms of peritoneal tuberculosis are not clear.   Such a collection in the pelvis it is practically impossible to distinguish from an ovarian or parovarian cyst.   The history of former attacks of peritonitis is not conclusive, since inflammation of the adnexa almost invariably exists, and the tissues and organs are so matted together that the bimanual examination conveys no definite information.   Explorative puncture per vaginam, in case the tumor is accessible, throws little light on the diagnosis, since the

fluid obtained bears a close resemblance to that of a hydrosalpinx or a par-ovarian cyst, though cylindrical epithelia (especially the ciliated variety) are, of course, absent. It has been the writer's experience that the diagnosis is made only by cœliotomy, which is clearly indicated in these cases.

The recognition of an intra-pelvic collection of pus does not present great difficulty when there is noted the characteristic history of a traumatic (*i.e.*, *septic*) or puerperal origin,—continued elevation of temperature, pain, and the usual septic symptoms. An abscess in the folds of the broad liga-ment is distinguished from a cyst in the same locality by its sensitiveness on pressure, immobility, irregular shape (often by its prolongation upward towards the iliac fossa), and firmer consistence. Should the extra-perito-neal abscess point towards the vagina, its intimate relation with the pos-terior fornix and the distinctness with which fluctuation can be obtained would be noted only in the case of a broad-ligament cyst: the history of the case and the aid of the exploring-needle would then be necessary. It should be remembered that appendicitis is by no means rare in the female, and that the pus in a retro-peritoneal abscess thus resulting may gravitate into the pelvis : its origin would hardly be overlooked if proper attention were paid to the ordinary symptoms of appendiceal trouble. Localized extra-peritoneal purulent foci around the rectum and beneath the vesico-uterine fold may be exceedingly puzzling. Intra-peritoneal abscesses sec-ondary to disease of the tubes seldom attain a considerable size, and, in addition to the history of tubal trouble, they are so surrounded by inflam-matory exudate that fluctuation cannot be obtained, while the difficulty of exactly locating them renders puncture a somewhat hazardous pro-cedure. Ovarian abscesses seldom reach a sufficient size to be mistaken for cysts, and the symptoms are much more acute. It is evident that it must frequently be impossible to distinguish a small suppurating cyst from a pelvic abscess, especially when the history is indefinite and when perfora-tion occurred some time before. A clue to the true condition would be ob-tained when the examiner is able to distinguish the globular outline of the cyst, to detect a certain degree of mobility, however slight, and the usual absence of the extensive exudate which surrounds an old abscess-sac. The cyst is more nearly retro-uterine, and may be felt to refill and empty itself more distinctly than an abscess-cavity. If by reason of exudate the evidence afforded by the bimanual examination is negative, any chance of an exact diagnosis being made is out of the question.

Enlargements of the tube from hydro- or pyosalpinx have been mis-taken for small ovarian cysts. This is likely to occur in the case of pyosalpinx, since, aside from the history of pelvic inflammation, if it reaches a sufficient size to form a considerable tumor, its elongated shape, the tenderness on pressure, and the obscure boggy sensation imparted to the finger, instead of distinct fluctuation, would point to the probable con-dition. Bilateral hydrosalpinx uncomplicated by inflammatory exudate ought to be recognized without much difficulty. Such an enlargement

confined to one tube is marked by its peculiar, elongated, tortuous shape. When the tube terminates in a globular cystic tumor the diagnosis of tubo-ovarian cyst may be made with more or less probability. A hydro-salpinx of unusual size, the distal end of which is adherent in Douglas's pouch, may present all the physical signs of ovarian cyst, nor would positive information be gained by the withdrawal of a specimen of fluid for examination. The same comments apply to pseudo-hæmatosalpinx resulting from hemorrhage into a previously dilated tube.

Fibro-myomata of the uterus, tube, or broad ligament, of the ordinary consistence, would hardly be mistaken for an ovarian cyst. A subperitoneal pedunculated fibroid may occupy a similar position to a cyst, and if it springs from the uterine cornu may present the same physical signs. Unless the abdominal wall is too thick, however, its greater density is at once apparent to the practised touch. A diagnosis between such uterine fibroids and fibromata and fibro-sarcomata of the ovary is possible only when the uterus can be clearly mapped out and the fact established that the tumor is connected with it by too long and slender a pedicle to be of uterine origin. Multiple fibroids surrounded by exudate, especially if ascitic fluid is present, may be mistaken for cancerous nodules, if the patient is in poor general condition. Time, or an explorative incision, will clear up all doubts. The sensation imparted by a small thick-walled cyst (especially a dermoid) intimately adherent to the posterior surface of the uterus may be almost exactly like that of a soft fibroid in a similar locality. Menorrhagia and enlargement of the uterine cavity may be common to both, as well as simultaneous movement of the uterus and tumor. When examined under ether the difference in consistence may be made out, as well as the more intimate relation of the fibroid to the organs. The pressure-symptoms due to an impacted fibroid are usually more marked than are those resulting from a cyst similarly situated. The writer has mistaken a semi-solid ovarian cyst adherent to the fundus uteri for a fibroid, the error being demonstrated at the operating-room. In another instance a semi-solid intra-ligamentous cyst which had become fused with the uterus was supposed by several experts to be a fibro-myoma, the history and physical signs being quite characteristic of the latter.

Retroversion of the gravid uterus at the third or fourth month would hardly be overlooked if the history of pregnancy was clear, but if the symptoms were masked by those due to pressure of the incarcerated organ, an incautious examiner, who did not bear in mind this possibility, might think that the globular, elastic (or even fluctuating) swelling in Douglas's pouch was a cystic tumor. A careful bimanual examination, under ether, if necessary, will demonstrate the absence of the fundus uteri in its usual position and the continuity of the cervix with the tumor, as well as the presence of Hegar's sign and other evidences of early pregnancy.

Other pathological conditions of the uterus, such as pyo- and hæmatometra, and congenital anomalies and atresiæ resulting in the retention of

menstrual blood in one horn of a uterus bicornatus, pregnancy in a double uterus, etc., though rare, should be considered.   Errors are often unavoidable, though a careful review of the history and close observation of the patient will do much to clear up the diagnosis.

Ectopic gestation, with the resulting conditions hæmatosalpinx and hæmatocele, has become so familiar to us of late years that we naturally think of its possibility whenever we discover an intra-pelvic tumor.   The symptoms and diagnosis of this condition have been so thoroughly discussed in a special chapter that it is unnecessary to call the reader's attention to any but the cardinal points,—a history of suppression or irregularity of menstruation, symptoms of pregnancy, colicky pains, and, in case of rupture, a sudden tearing pain in the lower part of the abdomen with more or less characteristic signs of internal hemorrhage.   Before rupture a distinct boggy (often pulsating) tumor is felt behind and at one side of the uterus, while after rupture there is a diffuse fluctuating or boggy mass in the broad ligament, or filling Douglas's pouch.   With this evidence a positive diagnosis can often be made ; but with an uncertain history, or with an almost entire absence of the usual symptoms, there might be considerable room for doubt whether the retro-uterine tumor was not a dermoid, especially as the pressure-effects with the two enlargements may be identical.   Normal pregnancy with a small ovarian cyst may lead to an error, as in a case of the writer's in which he opened the abdomen under the mistaken impression that he was dealing with an ectopic sac.   It is quite possible, also, that axial rotation and rupture of a cyst in a woman who presented symptoms of pregnancy should be regarded as rupture of such a sac.   In a patient seen for the first time great care is necessary in order to avoid error, and even then the surgeon frequently opens the abdomen with the expectation of finding something quite different from what he had diagnosed.

As regards the difference between pelvic hæmatocele and a small ovarian cyst, aside from the acute history and rapid formation of the former, it presents a less regular, circumscribed outline and fluctuation is indistinct.   If situated between the folds of the broad ligament, the tumor is somewhat elongated laterally and does not present the same globular swelling as a cyst.   Its relation to the mass of the ectopic sac is also apparent.   An intra-peritoneal hæmatocele the extension of which is limited by previously formed adhesions may cause a bulging in the posterior fornix similar to that of a retro-uterine cyst, but the distinct fluctuation obtained on palpating the latter is wanting, and there is absolute immobility.   On puncturing, either pure blood is obtained, or no fluid at all.   An old encysted ectopic sac may be unrecognized until suppuration and the discharge of fœtal bones reveal its true character.   The writer has recorded a case in which the fœtal bones felt through the wall of the sac were supposed to be bony nodules within a dermoid cyst, especially as the patient had the severe pain and pressure-symptoms so often noted in connection with the latter.   The history in these cases, as well as in those of old hæmatocele, is often entirely

misleading, so that the practitioner is most excusable for overlooking. the condition.   When the pelvic organs have been fused together as the result of one or more attacks of peritonitis, an autopsy alone may enable one to determine the nature of the tumor which was felt during life.   It should be noted that ectopic gestation may coexist with an ovarian cyst on the opposite side; in fact, any of the conditions above mentioned may exist as complications.   This only serves to show how difficult may be the differential diagnosis, so that the most experienced gynæcologist often refuses to commit himself before he has opened the abdomen,—a procedure which is clearly justifiable in case of doubt, especially in the presence of urgent symptoms.

Among other pelvic enlargements which may be encountered are hydatids, especially in the broad ligament,—an exceedingly rare affection in this country,—retro-peritoneal tumors, and malignant growths springing from the muscles or the pelvic bones.   A kidney may be so far displaced as to occupy the hollow of the sacrum behind Douglas's pouch (as in a case reported by Mundé), and the sac of a spina bifida may be found in nearly the same locality.   Post-rectal dermoids have been described.   Retroperitoneal malignant disease, as well as sarcomatous and osteoid growths, could hardly be taken for tumors of ovarian origin.   The writer has known of a fæcal mass in the sigmoid flexure being mistaken for a pelvic tumor,—an inexcusable error.

Adhering to the division of abdominal enlargements which has been proposed, we note the following which grow from *below* upward.   In the median zone are enlargements of the uterus, due to pregnancy, hæmatometra and fibroids or fibro-cysts, distended bladder, also large hæmatoceles, encysted collections of serum and pus, while in the inguinal and iliac regions are found pedunculated subperitoneal fibroids, pelvic and appendiceal abscesses, malignant disease of the cæcum and colon, herniæ, and various tumors of the abdominal wall.   The distinguishing characteristics of all those tumors which lie between the brim of the pelvis and the umbilicus is that their origin is indicated by a zone of tympanitic resonance between their superior border and the lower ribs, which is preserved even when they rise into the epigastrium, and the fact that they cannot be moved into the upper part of the abdomen.   Under this category may be included displaced viscera (kidney and spleen) which have become adherent in the lower half of the abdomen, so that it is impossible to return them to their original site.

It would seem as if advanced pregnancy ought never to be mistaken for ovarian cyst, yet the practitioner cannot afford to forget the possibility of error, in view of the recorded (and unrecorded) mistakes of prominent abdominal surgeons.   The writer long since arrived at the conclusion that in the absence of the characteristic symptoms the diagnosis of normal pregnancy at any stage may be one of the most difficult in the whole range of medicine.   He who has never made a mistake certainly has that experience before him.   Having watched a patient for three or four months before he

arrived at the positive conclusion that she had a cyst of the broad liga-
ment instead of being pregnant, and having recently seen in consultation
a patient supposed to be *in labor* who had an ovarian cyst with ascites,
he is inclined to urge the need of caution in every doubtful case; for it
is the doubtful cases—those of young girls and those of women who are
supposed to have reached the climacteric, both of whom deny or conceal
symptoms of pregnancy—that errors are most likely to be made. It is
unsafe to base a diagnosis upon a single point; it must be supported by
other evidence. In an ordinary case the history and physical signs at once
establish the existence of pregnancy; but the history may be negative,
menstruation being persistent, while the enlargement of the uterus does not
correspond to the supposed period of pregnancy, or else it is enormously
distended in hydramnios, fœtal movements cannot be appreciated either by
the patient or by the physician, and there are no heart-sounds; even the
characteristic rhythmical contractions cannot be felt. Under these circum-
stances it may be necessary to suspend judgment for several weeks, making
several examinations, if necessary, since fresh evidence may be obtained
at subsequent interviews. The recognition of a median, symmetrical en-
largement which has been progressive, the lower part of which is continu-
ous with the cervix, should at once awaken suspicion. Bimanual palpation
may cause contractions of the organ. External ballottement—the sensation
of a small body bobbing about in fluid within a closed sac—is a valuable
sign, which can be simulated only by a small solid tumor or a colloid cyst
floating in free ascitic fluid. The general condition of the patient and the
physical signs of ascites should indicate the pathological condition.

Rectal palpation may enable one to exclude pregnancy by the detection
of the small, unimpregnated uterus. There are cases, however, in which,
as the symptoms are not urgent, we are justified in counselling delay. The
complication of ovarian cyst with pregnancy has already been discussed.
It should be remembered that it may occur even in cases of bilateral
malignant disease of the ovaries.

Hydatidiform degeneration of the chorion may, on palpation, simulate
colloid cyst, especially if the enlargement of the uterus is irregular and con-
tinues beyond the ordinary period of pregnancy. After this time one would
be justified in exploring the interior of the uterus, although the peculiar
watery discharge, mingled with hydatids, would usually give a clue to the
true condition beforehand. Enlargement of the uterine body from a polypus,
malignant disease, hæmato-, pyo-, and physometra, have all been mentioned
as conditions which sometimes resemble ovarian tumors. Hydrometra would
seldom present a sufficient enlargement. Wells calls attention to the fact
that in many reported cases of hydrometra the discharge of fluid was prob-
ably really due to the escape of the contents of an ovarian cyst through
the tube into the uterus.

The writer has reported a case in which he performed cœliotomy for
abdominal pregnancy a month after full term in a case originally supposed

to be hydramnios with a dead fœtus, where it was impossible to decide positively, even under ether, whether the patient had a cancerous ovarian cyst or ascites from cancer of the omentum, so rapidly had her general health declined and fluid accumulated in the abdomen. The history in this instance was most misleading, and the vaginal examination showed the general bulging of the posterior vaginal fornix, with the fluctuation, seen in ascites.

An interstitial fibro-myoma of the uterus causes a symmetrical enlargement in the median line of the abdomen, the history showing a slow growth and an increase in the normal menstrual flow, while the patient is either in good health or is simply anæmic from loss of blood. The uterus is enlarged, as shown by palpation and the introduction of the sound, and is continuous with the tumor, moving with it. The cervix often disappears or is much shortened. The tumor has a hard or elastic feel which is quite characteristic, and is more likely to be mistaken for pregnancy than for a large ovarian cyst. Pregnancy may occur in a fibroid uterus, a point to be remembered before sounding its cavity. In the case of multiple fibroids, their firmer consistence, and the facts that they cluster around a median tumor and often move with it, and that there is considerable elongation of the uterine cavity (to four inches or more), would be arguments against the presence of a multilocular cyst. The detection of separate nodules in the uterine wall, or a hard retro-uterine tumor, would be additional evidence in favor of a fibroid growth. The diagnosis may be very difficult in the case of a subperitoneal tumor of softer consistence, attached to the uterus by a long pedicle and situated in the flank, especially since the uterus may be of nearly normal size and menstruation is not affected. While an examination under ether may enable one to distinguish such a growth from a semi-solid ovarian tumor, there is no certain means of distinguishing it from a fibroma or fibro-sarcoma of the ovary. Percussion usually furnishes negative results, but on auscultation a venous murmur corresponding to the pulse-beat will be heard in a considerable proportion of large uterine fibroids; this is rarely heard in ovarian cysts. The association of an ovarian cyst and a pedunculated fibroid does not give so favorable an opportunity for comparison as might be supposed, since it is frequently impossible to decide which tumor is the cyst and which the fibroid.

The difficulty of distinguishing between cysto-fibromata of the uterus and semi-solid ovarian cysts has been emphasized by all writers. Less stress is now laid on the importance of an exact differential diagnosis, since the surgeon is no longer appalled at the prospect of being obliged to perform hystero-myomectomy instead of a proposed ovariotomy. It may be stated in general that fibro-cysts are not only relatively infrequent, but are rarely found in women under thirty. They grow more slowly than ovarian cysts, but after attaining a certain size may enlarge rapidly, the general health, as a rule, not being seriously affected. Menorrhagia is not a constant sign, neither is elongation of the uterine cavity, especially if the

tumor is subperitoneal. The presence of distinct hard nodules would be significant, though semi-solid colloid cysts might give the same sensation. On palpation, fluctuation, when present, is seldom distinct, the tumor having rather an elastic feel. The cervix is often felt continuous with the tumor, and motion imparted to it is shared by the uterus. The advice formerly given to puncture the tumor in case of doubt is to be rejected in view of the great vascularity of fibro-cysts; moreover, the fluid removed is seldom characteristic. An explorative incision is the natural resort in case of doubt, when the dark vascular appearance and firm fasciculated structure of the fibro-cyst distinguish it from the pearly, glistening look of an ovarian cyst. A thorough exploration with the whole hand in the abdominal cavity may be the only means of settling the question of the origin of the tumor.

Hæmatocele seldom attains such a size as to form a large abdominal swelling. When it does, the history of the case, its irregular, indistinct outline as felt bimanually, its immobility, and its softness when recent, will indicate its character. An old encysted collection of blood may present the form of a smooth, round, dense tumor which crowds the uterus forward but does not move with it. In the absence of a clear history, it is practically impossible to distinguish an old hæmatocele that has undergone softening or suppuration from a suppurating cyst. Explorative puncture per vaginam gives little or no information, except in a recent case.

Reference has already been made to encysted ascites. A similar circumscribed collection of pus in the lower part of the abdomen presents the same physical signs, with an additional history of suppuration. The zone of indurated tissue and adherent gut around such an abscess is quite different from the environment of a suppurating cyst.

Tumors situated in the flanks which are most apt to be mistaken for ovarian cysts are subperitoneal fibroids and abscesses. The situation, elongated shape, and fixation of an extra-peritoneal pelvic abscess, as well as the history, are sufficiently characteristic. Intra-pelvic abscesses rarely form an abdominal enlargement, and their relation to inflammatory trouble of the adnexa can ordinarily be made out. They may complicate ovarian cyst, when the true condition can be made out only by direct examination through an abdominal incision. The collection of pus in appendicitis is too distinctly localized to be mistaken, while the pain and other symptoms should prevent error, except possibly in a case of adhesion of the diseased appendix to a small suppurating cyst.

Cancer of the intestine gives rise to a lateral tumor, which is recognized according to the ordinary rules of surgical diagnosis. The writer made an autopsy upon a patient with colloid cancer of the descending colon, which had been pronounced by experts to be a fibroma of either the uterus or the ovary. Hernia and desmoid tumors of the abdominal wall should be recognized with proper care. When the patient is very stout, however, or the tumor grows into the peritoneal cavity, it may be taken for an intra-peritoneal growth.

Reference has been made to tuberculous and cancerous nodules of the omentum and peritoneum, and the necessity which the practitioner is often under of being obliged to remove some of the ascitic fluid before these can be recognized. With tubercle there is seldom an excess of fluid, and fluctuation is limited. If encysted, the diagnosis may be exceedingly obscure, as already stated. It is not safe to depend too much on the history in cancer, since absence of pain and cachexia are frequently noted even in somewhat advanced cases. In an unusually stout patient with a limited amount of ascites the diagnosis may long remain uncertain. The characteristic feel of the thickened omentum is a valuable guide, though the same peculiar cake-like mass may be present when the omentum is loaded with fat or is thickened in consequence of ordinary inflammation. A small benign solid tumor of the ovary, accompanied by ascites, may be mistaken for a malignant growth. The slow accumulation of fluid and the absence of symptoms will convince the examiner, especially if the patient is kept under careful observation, that cancer is not present, especially if the tumor is unilateral. The slow growth and apparent benignancy of fibro-sarcomata should, however, not be forgotten. It has not infrequently happened that one surgeon has refused to operate, thinking that the tumor was malignant, when another has removed it and cured the patient,—a strong argument in favor of explorative cœliotomy in every case in which the condition of the patient is not evidently hopeless. Hydatid cysts of the omentum, as Sutton points out, being multiple, are more likely to be mistaken for cancerous nodules than for a multilocular ovarian tumor, especially when the characteristic fremitus cannot be detected. A simple cyst of the omentum may give all the physical signs of an ovarian cyst; indeed, the writer has found in fluid removed from such a cyst numerous cells identical in appearance with the so-called "Drysdale's corpuscles."

Ordinary care would prevent even an inexperienced examiner from mistaking a mass of impacted fæces in the descending colon for a neoplasm, but in the case of a circumscribed tumor as large as a man's head, situated in the transverse colon, there is a chance for error, especially when the length of the mesocolon is such that the tumor sags downward below the umbilicus. The history of constipation cannot always be obtained. In a case in the Woman's Hospital the patient had several diarrhœal movements daily, and presented a cachectic appearance which might have suggested the possibility of malignant disease. The tumor was dull on percussion, and could be moved freely in all directions, but on deep pressure could be compressed like dough, the pitting being persistent after the pressure was removed. Vigorous purgation and the use of high enemata of ox-gall soon caused its disappearance. There should be no doubt as to the condition when the history and symptoms indicate organic stricture of the gut.

Ordinary distention of the bladder from atony would be mistaken for an ovarian cyst only by a careless examiner, though cases have been reported in which the bladder has been tapped. One's obstetrical experience should

lead him to recognize at once the characteristic median pyriform swelling and distinct wave of fluctuation, as well as the relation of the swelling to the uterus. Mistakes are most liable to occur in cases where the retention of urine is due to the pressure of a pelvic tumor,—a retroverted uterus, fibroid or small ovarian tumor, benign or malignant; the practitioner, on detecting the smaller tumor, jumps to the conclusion that it has a direct connection with the fluctuating swelling in front. The caution to insert a catheter in every doubtful case is by no means superfluous.

The rare extra-peritoneal cysts which develop from the patent urachus have been mentioned, and should be considered in this connection, as they sometimes communicate with the bladder as well as rupture at the umbilicus. They are of rapid growth, and usually contain a clear fluid, though they are liable to suppurate, especially if urine enters them from the bladder. It is doubtful if they can ever be distinguished from ovarian or parovarian cysts before the abdomen is opened, and even then such a cyst would be extremely puzzling to one who encountered it for the first time. The tumor lies in front of the uterus and bladder. A peculiarity noted by Tait is the presence of dulness over the lower part of the cyst, with increased resonance towards and above the umbilicus, "yet the physical signs above the umbilicus are clearly those of encysted fluid."

A displaced kidney or spleen, situated in the lower part of the abdomen, may easily be mistaken for a small ovarian tumor, especially if the organ has undergone cystic degeneration. Careful questioning of the patient may elicit the fact that the tumor gradually descended from the original site of the viscus, to which it can be returned by manipulation. In a thin subject the peculiar shape of the kidney or spleen can often be detected. The writer once felt in the region of the umbilicus a secondary cyst in a multi-locular tumor which presented the same shape, mobility, etc., as an enlarged and displaced spleen. A sufficient number of cases have been reported in which the true condition was discovered only at the operating-table to cause the practitioner to bear in mind this rare form of abdominal enlargement.

Retro-peritoneal malignant disease is accompanied by severe localized pain, with or without rapid depreciation of the general health. In a case under the writer's observation there was an almost immovable globular tumor, the size of a man's head, situated in the hypogastrium a little to one side of the median line, and inaccessible from the pelvic side. There was tympanitic resonance over it, except when the intestines were displaced by deep pressure. It was supposed to be intra-peritoneal before its true location was determined by making an explorative incision.

Want of space forbids our considering other enlargements in the lower abdomen which have been mistaken for ovarian tumors, or *vice versa*. The enumeration of too many would only puzzle the reader, who will find it the safest rule in every case of doubt to consider first the most probable conditions, rather than to run over in his mind the long list of rare ones. It is possible for one to be hampered by too many facts at the bedside. A

few, well digested, are of more practical use than a confused mass of them which have not been properly arranged.

Tumors originating in the upper part of the abdomen are distinguished, at any rate in their earlier stages, by the existence of a distinct zone of tympanitic resonance between their lower borders and the pelvis. This distinction is important, especially when there are *two* tumors, one of pelvic and the other of abdominal origin. A neoplasm seldom attains such a size that this peculiarity is not to be noted. An obscure history, particularly if the patient is unintelligent, with especial difficulties in the way of an exact physical examination (thickness of the abdominal wall, matting together of the intestines, adhesion of the tumor to the pelvic brim, etc.), may render the diagnosis uncertain.

Enlargement or displacement of the kidney, liver, or spleen is the most frequent condition to be looked for. Less frequently dilatation of the stomach, cyst of the pancreas, enlargement of the gall-bladder, and hydatid cyst may require to be considered.

Renal tumors, either solid or cystic, might be mistaken for ovarian, though, as Sir Spencer Wells observes, there are few exceptions to the rule that the former press the intestines forward, while the latter displace them backward. On the other hand, a loop of intestine might slip between a small ovarian cyst and the abdominal wall, or might be adherent to its anterior surface in consequence of a former inflammatory process. Another contingency is the presence of a renal tumor so large that its usual relations are obscured. The history generally gives a clue to its origin. The frequency with which malignant growths of the kidney develop in young subjects is well known. It will nearly always be ascertained that the enlargement was first noted below the false ribs, and gradually extended inward towards the umbilicus, then downward to the lower part of the abdomen, the reverse being true in the case of an ovarian cyst. The history of hæmaturia, pyuria, or nephritic colic is an important point, as well as variations in the size of the tumor accompanied by a sudden increase in the amount of urine. The latter sign may be present in connection with rupture of a simple cyst, as before stated; but this accident is so rare that stress need not be placed upon it.

Pyonephrosis is accompanied by other symptoms which should indicate its presence to the surgeon. Hydronephrosis may complicate ovarian cyst. Catheterization of the ureters may then afford valuable information. Cystic degeneration and semi-solid tumors of the kidney are most likely to be mistaken for multilocular cysts and cysto-sarcoma. In the case of a renal tumor percussion will show dulness over its outer side, with tympanitic resonance anterior, due to the presence of the ascending or the descending colon, according as the right or the left kidney is affected.

A movable kidney would not be mistaken for an ovarian tumor with a long pedicle, unless it was displaced into the lower part of the abdomen; it is not necessary to repeat the rules for recognizing the displaced organ.

Examination of the urine may be entirely negative, as well as the examination of a specimen of cyst-fluid obtained by explorative puncture,—a procedure not to be recommended for diagnostic purposes alone.

Ordinary enlargements of the liver are generally made out without much difficulty, especially when the lower edge of the organ can be felt and an area of tympanitic resonance intervenes between this point and the brim of the pelvis. An excessive amount of ascitic fluid may obscure the true condition, in which case it becomes necessary to remove enough of the fluid to permit a more thorough examination. By this means the writer was once enabled to detect cancerous nodules in the liver and omentum of a patient whose youth and the absence of the usual history had led her physician to believe that she had a large ovarian cyst. Cystic disease of the liver, either simple or hydatid, is less easy to differentiate; but the history of the case, the origin of the tumor from the upper part of the abdomen, and the presence of intestine below it should place the examiner on his guard.

Enlargement of the spleen from malaria or leucocythæmia would hardly puzzle the general practitioner, though specialists have been caught napping, especially when the tumor extended as low down as the pelvis. Its origin from the left hypochondrium, its relation to the stomach, its mode of growth downward and inward, and its peculiar shape, as well as its downward movement on deep inspiration (a test which should be applied to all abdominal tumors), mark its true character. A history of malaria and the examination of the blood furnish additional corroborative evidence. Displacement of the normal spleen (unless as low as the pelvis) is not so likely to give rise to error as is extreme mobility of the enlarged organ. The writer has seen two explorative cœliotomies performed for the latter condition,—both fatal. When the organ is both displaced and cystic a mistake is pardonable, especially if it cannot be pushed upward to, or near, its original site.

Pancreatic cysts are not so rare as was once supposed, between thirty and forty having been operated upon, though the diagnosis has rarely been made beforehand. The cyst is usually first noted in the epigastrium below the left lobe of the liver, the stomach being displaced forward and the transverse colon downward, and generally moves on inspiration and expiration. Fluctuation is not always distinct. On making explorative puncture an alkaline fluid has been obtained of low specific gravity, containing a large amount of albumin and fat-globules, but no epithelial cells. The fæces may contain free fat and the urine sugar in these cases.

Dilatation and displacement of the stomach have been mentioned as possible causes of error, but a careful review of the history and the practice of the ordinary methods of percussing and palpating that viscus should enable the physician to guard against them. Unusual distention of the gall-bladder has deceived even so skilful a diagnostician as Tait, while other rare conditions, such as chylous cyst of the mesentery, have been mistaken for ovarian cysts.

Hydatid disease of the kidney, liver, and spleen, though so rare in this country, should be borne in mind. They give a history of rapid and irregular growth, and of beginning in the hypochondriac region and extending downward. Their thin, irregular outline, peculiar jelly-like feel, and characteristic fremitus distinguish them from an ovarian cyst. When they surround coils of intestine, the latter give areas of resonance in the midst of the general dulness which are never heard over a cyst. On puncturing a hydatid, the hooklets and scolices of the parasites will be found in the fluid.

Even from this hasty review of the question of differential diagnosis the reader will infer that it is a large subject, not to be fully mastered except after many years of experience and observation. It will be admitted that the general practitioner who has been accustomed to take a broad view of each case is, on the whole, less likely to make serious errors of diagnosis than the specialist, who relies too much on his intuition and is accustomed to resort promptly to an explorative incision in order to discover without delay the nature of a doubtful tumor. It is perhaps fortunate that the practitioner is seldom so situated that he can advise such an operation at the first interview,—fortunate for himself as well as for his patient. It cannot be denied that explorative cœliotomy, on account of its ease and comparative safety, has often been abused, being employed in many cases where not only is the tumor clearly of extra-pelvic origin, but all the clinical evidence is against the possibility of its removal. It is now constantly performed for every possible enlargement, actual or supposed, under circumstances which a few years since would have caused it to be regarded as little short of criminal. Surgeons have encroached on medical cases so much that it seems as if there would soon be no organic visceral lesion (except cardiac) which might not be studied by direct inspection or palpation. Whatever may be the advance in surgical skill and boldness in this tentative direction, we advise the occasional operator to confine his explorative incision to those cases in which he has to do probably with an *operable* tumor, the nature of which he has been unable to determine by the exercise of the ordinary methods of physical examination, conducted deliberately on several occasions, if necessary, and with the aid of anæsthesia. Moreover, humanity as well as a proper regard for his art should deter the surgeon from making such an incision in a patient who is so evidently weakened that she may not survive it.

It is only necessary to caution the beginner that by an explorative incision is meant the simple opening of the abdominal cavity and the introduction of one or more fingers, seldom the whole hand, in order to palpate the tumor, which may also be inspected as far as possible through the incision. The breaking down of adhesions or any injury to the growth by rough manipulation at once introduces another element into the case, from the risk of hemorrhage or inflammation, so that the patient is worse off than before. Many an explorative cœliotomy has ended in a serious,

it may be fatal, operation which the surgeon had no intention of perform-
ing.   Moreover, an incomplete operation is very different from a simple
exploration.   The aim of the latter is to settle a doubtful diagnosis without
serious risk to the patient.   Whether a radical procedure is attempted at
the time or not will depend upon the urgency of the case, the judgment
of the surgeon, and the previous understanding which he has had with
the patient and her friends.   In private practice this matter is naturally
viewed in a somewhat different light from that in which it is regarded in
hospitals, where so much more is left to the decision of the surgeon.

TREATMENT OF OVARIAN TUMORS.

It is not necessary at the present day to reiterate the statement made by
all writers that there is only one form of treatment for ovarian cysts, and
that is extirpation.   Medicinal treatment, electrolytic puncture, the injection
of iodine and other astringents into the cyst, would now be regarded as mal-
practice.   It is only a few years since that it was a frequent practice to tap a
cyst several times before its removal, a procedure which has been abandoned
by all who recognize its dangers.   There are, of course, circumstances under

FIG. 34.
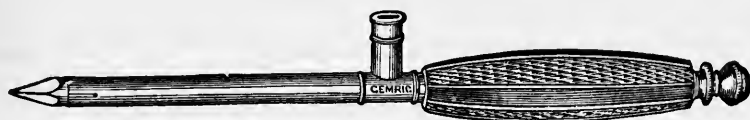
Trocar for puncturing cyst through abdominal wall.   (Goodell.)

which it may be impossible to perform ovariotomy on account of the objec-
tions of the patient or the friends (though it is seldom that these cannot be
overruled), or the presence of cancer, extreme weakness, or grave visceral
complications, which would render an operation inevitably fatal.   In acute,
sometimes in chronic, pulmonary affections it may be necessary to tap in
order to relieve dyspnœa; but in any case, unless, as Greig Smith puts it,
tapping is resorted to "simply to promote euthanasia," it should be regarded
merely as a step in the improvement of the patient's condition preliminary
to a radical operation.   In a recent case in which the writer withdrew eighty
pints of fluid in order to relieve acute pulmonary œdema which promised a
speedy fatal termination, the improvement was so rapid that he was able to
perform ovariotomy successfully three weeks later, removing a cyst then
weighing thirty or forty pounds.   It will be evident from what has been
said that he disapproves of diagnostic puncture through the abdominal
wall, except in cases in which a suspected tumor is obscured by ascites.

The dangers from tapping are the wounding of large vessels in the walls
of the cyst, the puncture of adherent intestine, the direct introduction of
sepsis, or the escape of septic or irritating fluid from the cyst, following the
withdrawal of the needle.   That these dangers are not exaggerated is shown
by cases in which the abdomen has been opened a few days or weeks after

puncture and an innocent fluid has been found to be transformed into an irritating one, or where the tapping has resulted in a localized peritonitis, causing parietal adhesions in a cyst which was previously movable. The tendency to a rapid dissemination of secondary growths after the tapping of an intra-ligamentous papillary cyst has been emphasized.

The aspirator is safer than the trocar, although the emptying of a large cyst by this instrument is slow and tedious. Strict aseptic precautions should be observed, the needle being boiled and kept in antiseptic fluid. If an ordinary canula is used, a rubber tube should be attached to it, the end being placed in a basin of carbolic solution to prevent air from entering the cavity. A point is usually selected midway between the umbilicus and the pubes where careful percussion has demonstrated the fact that no coil of intestine is in the way, though if fluctuation is more distinct on one side of the median line the needle can be introduced there. The skin should be prepared by thorough scrubbing and the application of ether, alcohol, and bichloride, as in an ordinary abdominal section. The operation is practically painless, or it may be rendered so by freezing the site of puncture with ether or rhigolene spray. The patient may lie on her side at the edge of the bed, or, if the cyst is unusually large, she may be supported in a sitting posture.

A few cautions to the inexperienced are pertinent. Having selected the point at which it is proposed to puncture, avoiding large superficial veins, the surgeon plunges his needle into the cyst to the depth of two or three inches, withdraws it quickly, and then holds it steadily. If no fluid escapes, the probability is that it is too thick to run. Instead of pushing the needle in deeper, an attempt may be made to clear its end with a blunt stylet; the same manoeuvre is adopted when it becomes clogged with a mass of lymph. As the cyst collapses, so that the fluid escapes more slowly or not at all, the end of the canula may be raised or turned to one side, while steady pressure is made on the sides and upper portion of the sac. The advice sometimes given to empty secondary cysts by re-introducing the sharp stylet and puncturing them is hardly safe for the beginner. Empty the main cyst entirely, if possible, in order to prevent subsequent leakage into the peritoneal cavity. As the canula is removed, the opening is at once covered with sterilized gauze, which may be secured by means of collodion or rubber plaster. The hollow left in the abdomen is then filled with cotton and a firm binder is applied, as much to relieve the patient's feeling of relaxation as to keep the dressings in place. She should remain in bed from four days to a week, until all danger of inflammation is over, the diet being light and the bowels being moved regularly.

Tapping per vaginam has been referred to as a means of establishing a doubtful diagnosis, though as the surgeon acquires increased experience and boldness he will be less apt to resort to it, except where he suspects the presence of pus. At the present day no one would think of emptying an abdominal cyst in this way. Tapping through this route should be confined

to impacted or adherent intra-pelvic cysts, where the pressure-symptoms are extreme and the patient refuses to undergo a radical operation. The sac must lie in contact with the vaginal fornix, so as to cause a distinct bulging behind the uterus. The median line is the point of safety. None but an expert should introduce a needle close to the posterior surface of the broad ligament, since there is danger of wounding the uterine artery or even the misplaced bladder,—accidents which the writer has seen happen to a justly celebrated gynæcologist. On the other hand, puncture per vaginam may reveal pus and enable the operator to incise and drain an adherent suppurating cyst with far less risk to the patient than if he attempted its removal, and with the same ultimate benefit.

It is hardly necessary to remind the reader that the aspirator is the only proper instrument to be used here, or that the vagina must be just as thoroughly scrubbed and disinfected as if one intended to perform a vaginal hysterectomy. The needle is best introduced by the sense of touch, the patient being in the dorsal position. If the operator desires to see the point of puncture, he can easily do so with the aid of a Sims speculum. Select a place just behind the uterus, where fluctuation is most distinct and no pulsating vessels are felt, and plunge the needle in boldly, directing the point upward in the axis of the pelvis. If pus escapes, introduce a narrow-bladed bistoury or sharp-pointed scissors alongside of the needle and make an opening sufficiently large to allow proper drainage. The subsequent treatment is that of an ordinary pelvic abscess,—curettage, irrigation (especially with peroxide of hydrogen), and drainage with iodoform gauze or a tube. It is better to give an anæsthetic, so that a thorough examination of the pelvis can be made.

It is a question if this method of treatment is not to be recommended to the practitioner in the case of firmly adherent cysts which are readily accessible through the vaginal fornix, in preference to cœliotomy, especially when the patient is weak and an evening rise of temperature points to pus-formation. Under these circumstances ovariotomy is certain to be attended with special difficulties, which, though they may not deter the experienced surgeon, may well cause the occasional operator to hesitate before confronting them.

OVARIOTOMY.

By this term is now understood the removal of tumors of the ovary and broad ligament through an abdominal incision. Vaginal ovariotomy may be dismissed as an operation which has fallen into disrepute, though its revival under proper indications may be expected. The reader is referred to special monographs for information regarding the history and statistics of the operation ; suffice it to say that it is now established on so firm a basis that the average mortality, including all cases, varies from five to ten per cent., the latter being considered as too high in the present age of abdominal surgery. As regards operations for cystoma, it has been said

that the number of contra-indications has been so lessened that practically the presence of a tumor is a sufficient indication for its removal. The long list of contra-indications formerly mentioned in text-books has now been shortened so as really to include only disease of the thoracic and abdominal viscera so advanced as to interfere with the performance of any other major operation. The risk of immediate death from shock from lesser degrees of cardiac and renal disease is now regarded as no bar to the successful performance of ovariotomy.

As Greig Smith justly remarks, "No writer is justified in doing abdominal surgery unless he is prepared to cope with every emergency which may arise, to do so promptly, and according to the well-recognized rules." The occasional operator may meet with a series of uncomplicated cases, the favorable result of which renders him over-confident. The successful ovariotomist must have a practical acquaintance with general surgery. The idea that no preliminary training is required is a most erroneous one. Ovariotomy may be one of the simplest or it may be one of the most difficult operations in surgery, and it is impossible to predict which it will be before the abdomen is opened. Any intelligent physician who has witnessed a few operations may remove a simple non-adherent cyst; whereas the enucleation of an intra-ligamentous tumor, or of one which has many intestinal adhesions, may call for the exercise of the highest surgical skill and experience. The beginner had better abandon the operation and close the abdomen than blindly to attempt such a procedure. The necessary experience can be gained only by a careful study of the anatomy of the pelvis, prolonged observation of the work of the best operators, and, above all, an apprenticeship as an assistant. Even then one learns only through his own errors. Reading and a theoretical familiarity with the details of an operation can never take the place of practical experience. This is said not to discourage the reader, but to convince him that boldness and self-confidence cannot be substituted for surgical knowledge. The factors of success in ovariotomy are rapid, careful work, the instant recognition of complications, and the power of dealing with them. These may convert an apparently hopeless case into a brilliant success. The word "luck" should be banished from the surgical dictionary : care and good judgment, not good fortune, insure success.

Every surgeon has a certain number of inevitable deaths from shock, hemorrhage, or visceral complications, but even these will become less frequent as his diagnostic skill and surgical experience increase. Sepsis is now rightly regarded as a direct reproach to the surgeon. Asepsis cannot be learned by intuition ; it must become a second nature with the surgeon, the result of long routine practice. A single flaw may vitiate the most carefully planned and skilfully executed operation. Unless a man firmly believes in the vital importance of cleanliness, there will always be an element of doubt as to his results. Operators differ in many minor details, as to the use of antiseptic fluids, etc., but the cardinal principle of cleanliness underlies the practice of all modern surgeons. While it is wise to imitate the

methods of the best operators, every ovariotomist finds that he must work out a certain technique which is best for *him*. The time has passed when numerous complicated instruments and a multiplicity of assistants are deemed necessary for the proper performance of abdominal surgery ; the more experienced the operator, the simpler are his preparations and the smaller is the number of his assistants.   In this respect the inexperienced observer may gain a false impression from witnessing operations in hospitals. In private practice, a single assistant, the anæsthetizer, and a nurse to wash the sponges, are all that are required, while the necessary instruments may be carried in a hand-bag.   The elementary details which will be given are deemed necessary, since it is assumed that the reader has not enjoyed the advantages furnished by hospital training.

To the surgeon of wide experience the question of assistants may not assume such importance, but even with him it involves one of the most vital elements of success.   The writer has often observed that distinguished cœliotomists have been apparently so much annoyed and hampered by the absence of their usual assistants that the operation has been anything but a success.   After working for a long time with a man who is intimately acquainted with the surgeon's peculiar methods, the latter is often greatly embarrassed by the presence of a strange assistant.   To the beginner, then, we would offer this important advice : unless in a case of emergency, never attempt ovariotomy unless the gentleman who stands opposite to you has had the same practical experience as yourself, or even greater.   Few men can do a complicated operation without feeling the necessity of advice or suggestion.   This is not a confession of ignorance nor an evidence of want of decision, but is a proof of the difficult nature of the task and of the importance of securing every element of success.

Before considering the operation itself, certain preliminary statements are à *propos*.   We cannot insist too strongly on the importance of keeping the patient under observation for several days prior to the operation.   It is of course assumed that there is no emergency to render immediate interference necessary.   The surgeon must become thoroughly acquainted with the patient, for a superficial examination on the day of the operation is not sufficient.   Obscure visceral complications may exist which can be recognized only by prolonged observation.   If possible, a week should intervene before the operation ; though the nervous condition of the patient may be such as to render it necessary to shorten the period of suspense.   Aside from disturbances incident to the presence of the tumor, she may have some affection of the thoracic or abdominal viscera, such as would lead to a fatal result.   These should be recognized and a careful history of the case obtained and repeated physical examinations made.   Routine examination of the urine is not sufficient to reveal the presence of obscure renal trouble.   A diminution in the amount of urine is a more significant symptom than the mere presence of an occasional trace of albumin or a few casts.   In private practice the surgeon cannot leave these matters to others,

but must attend to them himself. The presence of chronic disease of the heart, lungs, or kidneys is not necessarily a contra-indication with the present rapid methods of operating. Under these conditions the patient may be greatly benefited and her life prolonged by the removal of the tumor; but, since these always constitute an element of doubt, the beginner may well hesitate before touching a case of this nature. Each must be judged on its individual merits alone. The patient should be clearly informed of the risks incurred. At the present day statistics are more apt to be impaired by the disregard of such complications than by sepsis.

Season of the Year.—The writer had occasion some years ago to inquire into the truth of the opinion held by some writers that the mortality after operation during certain months was greater than during others. This is entirely erroneous.

Time of Day.—Other things being equal, the morning is the most favorable time for operation; the patient is then refreshed after a night's rest and is spared the anxiety of a day's waiting, the surgeon and his assistants feel fresher, and the light is good. In this country operations are usually done in the afternoon.

Preparatory Treatment.—As soon as the day of the operation has been fixed, the general health of the patient should be carefully attended to; the bowels should be thoroughly regulated by daily laxatives; frequent baths should be given, in order to increase the action of the skin. During the last three or four days the diet should be regulated, being confined to broths and easily digested food, milk being withheld in view of its constipating effect. Special attention should be paid to the stomach. If it is very irritable, suitable diet and medication should be employed.

It was formerly the custom to operate as nearly as possible midway between the two menstrual periods; it is now well known that the presence of menstruation has no deleterious effect: nevertheless, in view of the increased pelvic congestion which occurs at this time, many still believe it wiser for the surgeon not to select this time, unless some special emergency calls for an immediate operation.

Preparation of the Room.—It is not necessary to describe the preparations usually made in hospital. In private practice the room should be prepared by removing the carpets, curtains, portières, pictures, and movable furniture. The walls, floor, and wood-work should be thoroughly scrubbed, then mopped off with 1 to 2000 bichloride solution. Many surgeons hold that these precautions are unnecessary. Perfectly aseptic operations have been performed in tenement-houses with the most unfavorable environment. Recent investigations have demonstrated the presence of septic germs in the air, the injurious effect of which is lessened by keeping the room moist with steam.

Instruments and Dressings.[1]—The following instruments are all that

---

[1] For further details the reader will consult Chapter II.

are absolutely necessary for the performance of ovariotomy : a scalpel, one pair of curved blunt-pointed scissors, one pair of angular scissors, two pairs of mouse-tooth forceps, half a dozen small and two or three long hæmo-static forceps, two pairs of cyst-forceps, an aneurism-needle or ligature-passer, a trocar, a needle-holder, curved needles, large and small, braided or twisted pedicle-silk, catgut, silkworm-gut, silver wire (No. 26 or 27), a dozen small sponges, and three or four large flat ones. A Paquelin cautery, aspirators, retractors, volsella, écraseur, rubber tubing, and extra clamps should be at hand in case of need. In view of the possible necessity of repairing injuries of the intestine, the proper needles threaded with fine silk should not be omitted.

On account of the difficulty of preparing and keeping sponges, many surgeons now use pads of sterilized gauze, four by six inches, consisting of four or five layers sewed together. These can be used both for sponging the wound and for introduction into the abdominal cavity. Three or four dozen of these should be prepared ; they should be thrown away at the end of the operation. The writer now uses them in preference to sponges, especially in septic cases.

The dressings consist of powdered boracic acid, iodoform, aristol, or dermatol, and sterilized gauze, to be held in place by broad strips of rubber adhesive plaster. The surgeon should also be provided with a number of bandages of ten-per-cent. iodoform gauze, two inches in width and two or three yards long, for packing the pelvic cavity. These should be prepared with the greatest care, and should be kept in an aseptic glass or rubber box. Half a dozen drainage-tubes of small calibre and various lengths should be provided. The writer prefers a tube from one-eighth to one-fourth of an inch in diameter, closed at the bottom, with lateral openings in its lower third. The reader is referred to the chapter on general technique for information regarding the preparation of sponges and dressings and the care of the instruments. Instruments may be wrapped in a towel or piece of gauze and dropped into a kettle of boiling water containing a teaspoonful of soda, as soon as the surgeon reaches the house. The boiler described in Chapter II. (Fig. 13) meets all the requirements, and is simple and portable. Successful operators now agree that the field of operation and everything which comes in contact with the wound should be rendered aseptic previous to the operation, and that nothing but simple boiled water should be used at the time. It is not necessary, as it was formerly supposed to be, to place the instruments in strong carbolic-acid solution, or to wash the hands in 1 to 2000 bichloride at frequent intervals during the operation, unless they come in contact with pus, when, of course, they should be at once thoroughly disinfected.

It is not sufficient that the surgeon and his assistants should be scrupulously clean ; the operator must see to it that his nurses are just as careful as the doctors, and to this end no nurse should be employed in an ovariotomy case who has not had a thorough aseptic training. It is impossible

for the operator to watch every one during the operation, but his principal assistant should keep an eye on the nurses and see that they do not omit to disinfect the hands thoroughly after touching any unclean object. This caution is by no means superfluous, since during the excitement of an operation the most careful nurse may momentarily forget herself and pick up an instrument or a sponge which has dropped on the floor.

The Table.—An ordinary kitchen table that has been thoroughly washed, first with soap and water and then with bichloride solution, will answer perfectly well. It need only be sufficiently long to sustain the trunk of the patient, the feet being placed upon a chair. Ingenious tables have been devised for operations in the Trendelenburg posture, which are described elsewhere in this work. Some of these are portable, and may be carried to a private house. In a case of emergency the patient may easily be placed in an inclined posture by flexing the knees over the back of an inverted kitchen chair. The reader must not forget that Trendelenburg's posture is not secured by simply elevating the foot of the table.

The table should be prepared by the nurse with a clean blanket, over which are spread a rubber cloth and a sheet. Two small blankets should be in readiness, one to cover the legs and the other the chest of the patient, with two pieces of rubber cloth to be placed over these. There should be likewise a small stand for the instruments, two bowls and pitchers, a slop-pail or foot-tub, and plenty of boiled water, both hot and cold.

The night before the operation the patient receives a warm bath and a thorough scrubbing, especially the abdomen; the pubic hair is shaved by the nurse, and a gauze compress wrung out of bichloride solution (1 to 2000) is placed on the abdomen and held in position with a bandage, which is not removed until the patient is placed on the operating-table. Some use a dressing of soft soap. If the operation is to be at nine o'clock in the morning, the patient is given a laxative the night before, a light supper, and, if she is restless or sleepless, a little bromide at bedtime. At seven o'clock the next morning the lower bowel is thoroughly emptied with an enema, even if the medicine has acted freely. She is kept quiet in bed, receiving nothing by the mouth until an hour before the operation, when she is given half an ounce of whiskey.

In the mean time the nurse sees that the room and necessary appliances are in readiness. She has provided two dozen sterilized towels, an abdominal binder, safety-pins, stimulants, etc. A wash-boiler is filled with water, and a clean kettle is provided for boiling the instruments, unless the surgeon uses his own sterilizer.

At the proper time the administration of the anæsthetic is begun in an adjoining room. As regards the choice of anæsthetics, it may be regarded as the general practice in this country to use ether, cases being excepted in which there is marked albuminuria or some bronchial affection in which œdema of the lungs is feared. The administration of ether during ovariotomy should be intrusted only to one thoroughly familiar with this duty,

who will give his entire attention to it.   A stimulant should not be given within half an hour of etherization, as the patient will be likely to vomit it before the operation begins.   If she is very weak, if her stomach is irritable, or if the surgeon fears that the operation will be a long and difficult one, attended with considerable shock, it is good practice, as soon as she is sufficiently under the influence of the ether, to give a high rectal enema of a half-pint or a pint of hot salt solution, containing one or two ounces of whiskey or brandy.   It has always seemed to the writer better to do this at the beginning of the operation than to wait until the patient is exhausted by shock or loss of blood and to interrupt the operation in order to give the enema.

While the anæsthetic is being administered, the surgeon and his assistant, who have previously sterilized their hands according to the rules familiar to all,—that is, by scrubbing for five minutes with soap and hot water, immersing for two or three minutes in alcohol, then in a solution of bichloride (1 to 1000) for the same time, and lastly in boiled water,—remove the instruments from the sterilizer and place them in warm boiled water.

In an operation conducted in the ordinary posture[1] the surgeon stands

FIG. 35.
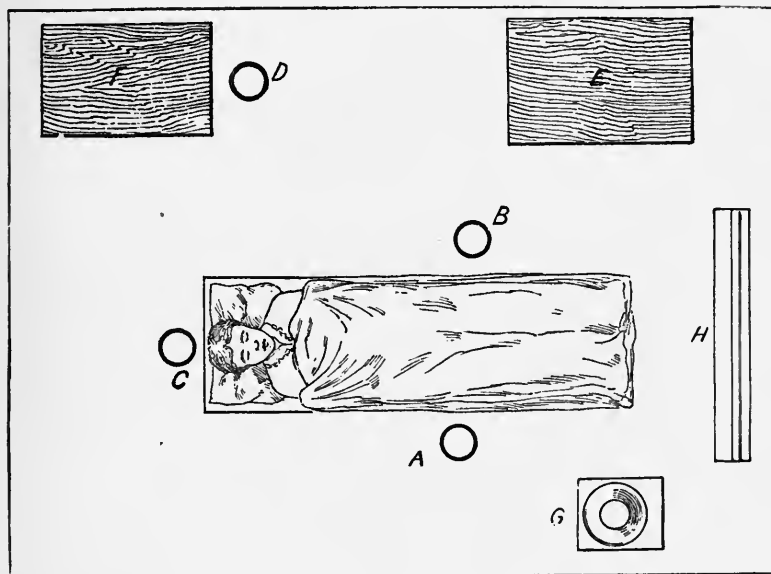
Positions of patient, operator, and assistants in ovariotomy. (Modified from Thomas-Mundé.)— *A*, operator; *B*, assistant; *C*, anæsthetizer; *D*, nurse; *E*, table for instruments; *F*, table for sponges; *G*, basin for boiled water or bichloride solution; *H*, window.

on the right of the table, his assistant opposite.   Behind the assistant is the nurse with the sponges.   If the surgeon prefers to handle the instru-

[1] For the full description of cœliotomy in the inclined or Trendelenburg posture the reader is referred to the section on hystero-myomectomy.

ments himself, which is the better plan if he has a strange assistant, a small stand at his right will contain the instruments arranged in one tray and the needles and sutures in another. The necessary dressings and extra instruments, rolled in a sterilized towel, should be at the left of the assistant. The foot of the operating-table is placed as close to a large window as practicable.

The patient, having been anæsthetized and her bladder emptied by catheter, is brought in and placed on the table, wearing a night-gown, thick drawers, and an undershirt and woollen stockings. The night-gown and undershirt are drawn up over her chest and the drawers down over her knees; her feet are placed upon a chair at the foot of the table, the thighs being slightly flexed by a pillow or a rolled blanket placed under the knees. Her chest and lower limbs are protected with blankets, over which are placed pieces of rubber sheeting.

The assistant now removes the bandage which was applied the night before, and thoroughly disinfects the abdomen as follows: it is scrubbed first with soap and water, using a sterilized brush (a soft plate brush); it is then washed with ether, special attention being paid to the umbilicus, then with alcohol, and finally with bichloride solution (1 to 1000). As it may be necessary to perform hysterectomy, the vagina should also be thoroughly cleansed according to the rules laid down elsewhere. The assistant again disinfects his hands, and pins warm bichloride (or sterilized) towels over the abdomen, chest, and lower limbs, the median line of the lower part of the abdomen alone being left exposed.

It is good practice for both the operator and his assistant to palpate the abdomen carefully before beginning the operation, in order to satisfy themselves again regarding the presence of a tumor and of its probable character.

Having satisfied himself that the patient is thoroughly anæsthetized, the surgeon is ready to begin. The operation has been divided into four stages: 1, the abdominal incision; 2, separation of adhesions; 3, emptying and extraction of the cyst and ligation of the pedicle; and, 4, toilet of the peritoneum and closure of the abdomen.

1. The Abdominal Incision.—A few years ago the length of the incision was supposed to have an important bearing upon the prognosis of the operation. This idea has been abandoned. It makes no difference to the patient in an aseptic operation whether it is two or four inches in length, whereas it makes an essential difference whether the surgeon wastes ten minutes in trying to deliver a large tumor through a small opening, or at once makes a free incision through which he can remove it without difficulty. The experienced operator will be able to judge beforehand, to some extent, whether he will be able to operate through a three-inch incision or one twice as long. It should not be less than three inches in length, and should be made with a bold, free cut, and not with a series of irresolute nicks. If the abdominal wall is quite thin, care must be exercised not to

open the peritoneum and perhaps to wound underlying intestine at the first cut; this is an accident which has happened to good surgeons. On the other hand, in the case of a patient with three inches of adipose tissue between the skin and the fascia, it is manifest that a long, deep incision must be made at the outset. It is a cardinal rule that the peritoneum should be exposed and incised as quickly as is consistent with safety, the surgeon always bearing in mind that a loop of intestine may be adherent directly in the line. It was formerly supposed to be necessary that it should be made directly in the median line; but this is comparatively unimportant. Some hold that a firmer cicatrix will be secured by dividing the muscles. A director is not needed: its use shows that the operator is either timid or inexperienced. Having cut down upon the fascia, it is divided and the properitoneal fat exposed. This is often so thick as to lead the operator to

FIG. 36.
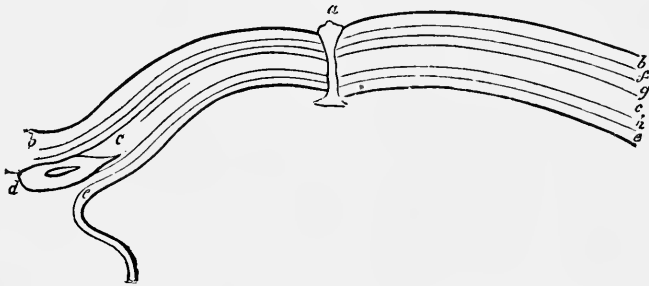
Diagram showing tissues divided by an incision in the median line of the abdomen.—*a*, umbilicus; *b*, skin; *c*, linea alba; *d*, symphysis pubis; *e*, peritoneum; *f*, superficial layer of areolar tissue; *g*, deep layer of areolar tissue; *h*, properitoneal fat. (Wells.)

believe that he has already entered the peritoneal cavity and has the omentum before him; but the color of the fat and the absence of vessels constitute an important difference. Spouting vessels are caught with pressure-forceps, so that all the hemorrhage may be stopped before the peritoneum is opened. The peritoneum, which may be recognized by its smooth, glistening appearance, is caught up with two mouse-tooth forceps and lifted well out of the wound, and a small nick is made between them. The operator now introduces his forefinger and satisfies himself as to the absence of parietal intestinal adhesions. If these are present, another opening should be made higher up, in order to reach a spot which is free from them. Sometimes the cyst is firmly adherent along the line of incision, so that careful inspection is necessary in order to distinguish cyst-wall from peritoneum. Good operators have stripped off the peritoneum over a considerable area before they discovered that they were not peeling off an adherent sac. The surgeon then introduces his forefinger as a guide, and enlarges the peritoneal incision with angular scissors to a length corresponding with that of the external wound, being careful to cut upon the finger, in order to avoid wounding omentum or gut. Two fingers are now introduced, or

the whole hand, and the abdomen is thoroughly explored, in order to make out the nature of the tumor, its relations, the presence of adhesions, and possible secondary growths on the peritoneum.

The operation is thus far simply explorative, and, provided that no damage has been done to the tumor and adhesions have not been generally broken up, it may be terminated at this point, if the surgeon deems that it is wiser not to proceed. His decision will be based in each instance on his own experience and judgment, the advice of his colleagues, and the previously expressed wishes of the patient. Happy is the cœliotomist who is not haunted by memories of fatal cases in which, against his better judgment, he did not rest content with a simple exploration.

If he finds that he has to do with a simple ovarian cyst, with few or small semi-solid portions, the original incision may be sufficiently long, and he may proceed at once with the second step; but if he encounters a large solid or semi-solid tumor which can be only partially emptied with a trocar, if at all, it is wiser to extend the incision to the necessary length (five to eight inches), which is done with the scissors as before. The incision may be carried around or straight through the umbilicus. In the mean time, the assistant seizes the bleeding points with pressure-forceps, and with a flat sponge or gauze compress protects the lower portion of the wound, preventing the escape of intestine. Hot towels should be frequently applied to the abdomen during the course of the operation. The intestine and bladder, especially where the latter is drawn up in front of the tumor, have been wounded by premature opening of the peritoneum. This accident should not discourage the operator, but he should at once close the viscus with a Lembert suture of fine silk and then proceed with the operation. Sometimes the peritoneum is so thickened from previous inflamma-

FIG. 37.
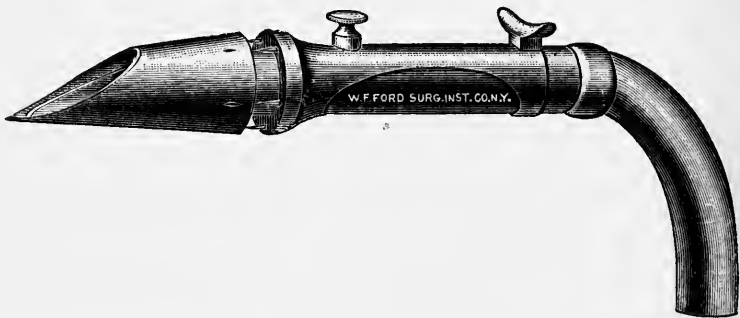
Trocar to prevent escape of cyst-fluid into the abdominal cavity. (Bissell.)

tion, or is so fused with the cyst-wall, that the surgeon may strip off the peritoneum under the mistaken impression that he is separating the cyst. In order to avoid this error, if there is any doubt whatever, he should extend his incision upward till he reaches a point above that at which the

cyst is adherent, when he can easily proceed to effect a separation from above downward.   Under some circumstances, however, it is better to tap the cyst before making this separation, especially if the contents are purulent or infectious.

2. **Separation of Adhesions.**—(*a*) *Adhesions to the Abdominal Wall.* —These are separated by introducing the flat hand between the cyst and the wall and sweeping it around over the whole surface of the tumor until all the bands are broken up.

(*b*) *Omental Adhesions.*—Slight adhesions may be broken up in a similar way, but if these are somewhat firm it is best to draw them into the wound and ligate them between two catgut sutures.   If time is an important element, they may be temporarily secured with forceps, ligatures being applied subsequently.

(*c*) *Intra-Pelvic Adhesions.*—These adhesions, especially in the case of small, impacted tumors, must be broken down by the finger with great care. It is in these cases that Trendelenburg's posture is especially valuable, because the surgeon can *see* exactly what he is doing, and will not make the mistake of taking an intra-ligamentous cyst for a tumor lying behind the broad ligament and shut in by old adhesions.

(*d*) *Intestinal Adhesions.*—The management of intestinal adhesions requires much care and delicacy of manipulation.   It is better to separate them when they are in plain view than to trust entirely to the touch. Slightly adherent loops of gut may be separated by light sponging; in any case, the pulp of the forefinger is to be used, the surgeon working against the wall of the cyst rather than against the intestinal wall.   Oozing is controlled by pressure.   If a considerable extent of the serous surface of the gut is stripped off, a few Lembert sutures of fine silk should be at once introduced.   Under some circumstances it is better not to attempt the separation of the gut at all, but to detach a portion of the cyst-wall, leaving it adherent to the intestine.   The presence of firm, general intestinal adhesions may determine the surgeon either to abandon the operation or to be content with simple drainage of the cyst.   Each case is to be treated according to its merits and according to the experience of the surgeon.   There is sometimes considerable shock from such prolonged manipulations.   One man will be able to finish successfully an operation that would be hazardous in the hands of another of less skill and experience. It sometimes happens that during the attempts at separation either a hole is torn in the gut or it is torn completely across.   According to the extent of the injury, the surgeon will be called upon to perform at once either linear suture of the gut or enterorrhaphy.   He should not be appalled at this accident, since it by no means implies a serious result.   The operator must determine for himself whether it is best to separate all the adhesions before tapping the cyst, or to reduce its size and draw it out of the wound, separating adherent loops of intestine as they appear.   In the case of a large tumor the latter is sometimes the better course to pursue : at any

rate, only the principal cyst should be evacuated previous to the separation of the adhesions.

3. **Emptying and Extraction of the Cyst and Ligation of the Pedicle.**—(a) *Tapping the Cyst.*—The cyst having been exposed, the edges of the abdominal wound are protected with flat sponges or gauze pads and a trocar is plunged into the sac. Most surgeons do this with the patient on the back ; a few prefer to turn her upon the side, in order to avoid the possibility of any fluid escaping into the peritoneal cavity. The care which the surgeon exercises in this respect will depend upon the importance which he attaches to the contact of the cyst-fluid with the peritoneum. The writer was convinced by an unfortunate experience that it is impossible to predict from its macroscopical appearance whether a fluid is infectious or not. A quantity of thick caseous matter and hair from a dermoid cyst may escape into the cavity and give rise to no irritation ; whereas a thin, apparently innocent, fluid from a simple cyst may possess the most virulent properties, as noted in a recent case. It is certainly better, if it can possibly be avoided, to allow no fluid to trickle down into the cavity, whether the patient is on the side or on the back. It is easier to prevent this when she is in the former position.

Immediately after plunging the trocar into the cyst, the surgeon should seize it with a hook, draw it up into the wound, and grasp it with cyst-forceps. As the sac collapses it should be drawn still farther out of the wound, the assistant in the mean time so thoroughly surrounding it with sponges and towels as to prevent any escape of the fluid. If the fluid is too thick to flow through the trocar, or if a sufficient quantity has been evacuated to allow the cyst to be dragged partly out of the wound, the surgeon should at once remove the trocar, enlarge the opening in the sac with scissors, and rapidly evacuate its contents. The whole hand is now introduced into the principal cyst-cavity, the colloid material is rapidly turned out of it, and secondary cysts are broken through so as to discharge their contents into the central cavity. Traction is in the mean time kept up on the cyst until it is sufficiently reduced in size to be dragged out of the wound. As it is drawn out, the assistant is ready with flat sponges to prevent the escape of the intestines.

Unsuspected omental or intestinal adhesions may still remain to be separated with sponge or fingers, bleeding vessels being ligated, if necessary.

(b) *Ligation of the Pedicle.*—If it is found that the fluid is colloid or is distinctly purulent, it is the practice of some operators to irrigate the cyst freely with boiled water or an antiseptic solution. This takes extra time, and is unnecessary if the adhesions have been thoroughly separated so that the surgeon will complete the operation.

Having drawn the cyst out of the abdominal wall so as to expose the pedicle, the surgeon now proceeds to ligate it. An ordinary aneurism-needle is generally used for passing the ligature : the instrument devised by Dr. Clement Cleveland will be found especially convenient. (Fig. 38.)

Some surgeons prefer stout catgut, which has the advantage of being ab-
sorbable material, but the majority are still rather afraid of it, on account
of the danger of slipping. Twisted Chinese silk, thoroughly sterilized, is
the most reliable material for the ligature, and is practically non-irritating.

FIG. 38.

Cleveland's ligature-passer.

The aneurism-needle is threaded with a double ligature at least two feet
long, and is passed through the pedicle just above the round ligament,
within from half an inch to an inch of the uterine cornu. The loop is
now divided, the aneurism-needle is withdrawn, the ligatures are crossed
by one or two turns, and are tied with a surgeon's knot. While the sur-
geon is tying the ligature the assistant should lessen his traction on the cyst
a little. It is unnecessary to add that the knot should be tied slowly and
deliberately, not so tightly as to cut into the tissue, yet so firmly that slip-
ping will be impossible. After cutting one ligature short, the two ends of
the other should be passed around the entire pedicle, and again tied in the
same manner. The cyst is now cut away at a distance of about a quarter
of an inch from the ligature, two pairs of compression-forceps having
been placed on the pedicle just below the point of section. The stump is
touched with the Paquelin cautery, is sponged dry, and carefully inspected.
If the vessels are of unusually large size, it is good practice to ligate the
principal ones separately with fine silk. Although it is desirable to avoid
a multiplicity of ligatures, if there is the least doubt with regard to the
security of the stump it is better to transfix and to tie below the original
ligature, or to place a single piece of silk around the whole. In the case
of a broad, fleshy pedicle it is necessary to ligate it in sections, using the
so-called cobbler's stitch.

The ligation of the pedicle, although a simple procedure, is one of the
most important steps of the operation, which fact is thoroughly appreciated
by those who have been so unfortunate as to lose patients from hemorrhage
due to slipping of the ligature. The stump should not be dropped back
until the surgeon is sure not only that the ligature is firm, but also that
there has been no undue retraction of the included tissues. Nearly all the
fatal cases of so-called " secondary hemorrhage" after ovariotomy have been
due clearly to careless or improper application of the ligature, or to the fact

that the surgeon did not leave a sufficient amount of tissue beyond it. The application of the cautery furnishes an additional safeguard against hemorrhage, as well as against infection from a septic surface.

FIG. 39.
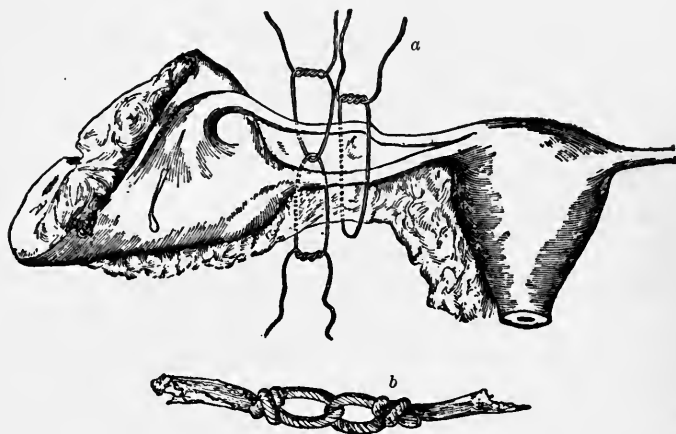
Ligation of the pedicle.—*a*, ligation with a single and a double ligature; *b*, double ligature after it has been tied. (Modified from Spencer Wells.)

If a large fleshy stump is left, it is well to cover the raw surface with peritoneum, without cauterizing, provided that such traction is not made as to imperil the firmness of the ligature. Doubtless this little procedure will often prevent subsequent adhesion of the stump to a contiguous loop of intestine.

After the stump has been dropped back, the opposite ovary is brought up into the wound and is carefully examined. Surgeons will often differ as to the indications for its removal. The wishes of the patient, especially with regard to a future pregnancy, must always have considerable weight. In a general way it may be stated that when the ovary is enlarged to three or four times its normal size, and is clearly the seat of general cystic degeneration or fibroid hypertrophy, there can be little doubt as to the propriety of sacrificing it. Even if it is not notably enlarged, but is buried in adhesions (especially if there be accompanying disease of the tube necessitating its removal) and has given the patient considerable trouble, most surgeons would not hesitate to extirpate it. On the other hand, if the patient earnestly desires to preserve the function of menstruation and the capacity for conception, the superficial cysts may be punctured, or diseased portions of the ovary may be excised and the tube rendered pervious, as described in Chapter XII. It is proper to caution the reader not to carry his conservatism so far as to attempt to save an ovary which is practically an incipient cyst, since cases are sufficiently common in which it has been necessary to remove a second tumor as large as the first within a year or two after the former operation.

4. Toilet of the Peritoneum and Closure of the Abdomen.—

The last stage of the operation consists in cleansing the peritoneal cavity, securing any bleeding vessels, and closing the wound. This is an exceedingly important step, and should not be slurred over, even though the operation may have been so long and bloody that the patient is in a serious condition from shock or loss of blood. To leave several bleeding vessels, or a quantity of cyst-fluid, within the cavity in order to finish the operation hurriedly, is often to vitiate the most rapid and brilliantly executed ovariotomy.

The first point is to thoroughly sponge out the abdomen. Most of the blood or other fluid will have gravitated into the pelvic cavity, from which it can easily be removed. If the blood rapidly accumulates, it is a sign that bleeding is going on somewhere. It is the practice of many surgeons to attempt to arrest this bleeding by the use of hot-water irrigation. The writer holds that it is better to search for and to secure the bleeding points first, then to irrigate, if desired. This bleeding will be either arterial or venous. If arterial, it probably comes from a spouting vessel in the omentum or raw surface of the intestine, or there is possibly a point deep in the pelvis. The omentum should be carefully inspected, being spread out on a hot towel, if necessary. Bleeding points are to be tied with silk or catgut as quickly as possible and the viscera replaced. Oozing from fine parietal or intra-pelvic adhesions may be disregarded, since it can usually be stopped by sponge pressure. The surgeon should actually *see* where the hemorrhage comes from, and for this end the Trendelenburg posture possesses obvious advantages. If blood alone escapes into the cavity, and the patient has no severe shock, irrigation will be unnecessary. The hæmostatic and stimulating effects of hot water within the peritoneal cavity are well known. No special apparatus is necessary. Boiled water or saline solution at a temperature of 110° F. may be poured freely into the abdomen from a pitcher and allowed to circulate among the intestines. From one to several gallons may be used. This is quickly removed with hand sponges, the pelvic cavity is wiped dry, and, if there is much oozing, the cavity is temporarily packed with sponges or gauze.

We have thus far referred to the escape of blood alone into the cavity. Many surgeons employ irrigation for the removal of pus, colloid material, and other ovarian fluids. This may be good practice when such fluids have been disseminated throughout the abdominal cavity, but the writer is convinced that when they have been confined to the pelvis it is better surgery to remove them thoroughly with pads or sponges, rather than to disseminate them among the intestines. It is a question whether the practice of attempting to arrest free oozing with hot water is not equally unscientific.

If there is troublesome oozing from the depths of the pelvis, it is the surgeon's duty to satisfy himself that there are not still some bleeding vessels which can be secured. Haste or carelessness in this respect has cost the lives of not a few patients. Provided that the oozing is general,

from a large raw surface deep down in the pelvis, it is best controlled by packing with strips of iodoform gauze which are brought out through the lower angle of the wound.

Drainage.—This leads us to a consideration of the question of drainage, one which has been widely discussed, but which may be regarded as still unsettled. All experienced abdominal surgeons hold decided opinions on this subject, yet such opinions differ widely. Some drain in nearly every case in which they have had extensive adhesions, oozing, or the escape of a suspicious fluid; others adopt the general principle of draining in every case in which they irrigate. Some do not irrigate at all, and yet drain; others irrigate frequently, and rarely drain. It is difficult to lay down a fixed rule for the guidance of the inexperienced. The general application of the advice "when in doubt, drain" would be a mischievous one. Probably the reverse would be the better working rule: "when in doubt, do *not* drain." It should be remembered that the drainage-tube is a necessary evil. Its proper care requires a thorough knowledge of the rules of aseptic surgery and entails much extra care and responsibility on the part of the surgeon: he cannot delegate this work to any but an experienced nurse or assistant. Probably few cases of ovariotomy really require drainage. The writer would limit it to those in which a quantity of pus or suspicious fluid has escaped during the operation and has been disseminated among the intestines, and in which a large raw or sloughing surface remains which it has been necessary to pack with gauze. One of the most valuable applications of the drainage-tube is its indication of hemorrhage during the first twelve hours following the operation. The writer has little confidence in gauze alone as a drain for the pelvic cavity, and has been accustomed to use a tube—at least for a few hours—in a case in which gauze packing has been employed.

Personal experience and an observation of the work of successful operators have convinced him that the use of the drainage-tube is becoming more and more limited as the rules of aseptic surgery are more generally applied, and that the ideal method of drainage is per vaginam. In hospital practice, abdominal drainage may be followed by the most satisfactory results, but in private operations, especially where the patient must be left in the care of a general practitioner, the surgeon must feel the greatest anxiety if he has left in a drainage-tube, to be attended to and removed according to the judgment of the inexperienced physician.

Provided that there has been persistent oozing, with a large raw surface within the pelvis, we first introduce the necessary amount of gauze, which may vary from five to ten yards; then we carry a drainage-tube down to the bottom of Douglas's pouch, choosing one of sufficient length to project an inch above the level of the abdominal wound. The tube is now filled with a strip of gauze, and the surgeon is ready to close the wound, which may be done with silver wire, silk, or silkworm-gut.

Closure of the Wound.—Silkworm-gut is probably the cleanest and least

irritating form of suture, since it can be rendered absolutely aseptic, and can be left *in situ* for three or four weeks, if desired. The surgeon must bear in mind not only the desirability of immediate coaptation of the edges of the wound, but the avoidance of complications, such as mural abscesses and the subsequent development of ventral hernia. The former are eliminated by absolute asepsis during the operation, and by avoiding, as far as possible, bruising of the edges of the wound by forceps or rough manipulation.

It is desirable to cleanse the edges of the wound thoroughly before and after inserting the sutures. These are introduced in the following way. After drawing down the omentum to its proper position, a small flat sponge or pad is placed in the cavity beneath the wound. Beginning at the upper angle, the surgeon inserts a curved needle at a distance of an eighth or a quarter of an inch from the edge, according to the thickness of the wall, and passes it through all the layers of the wound, being careful to include the fascia. In order to insure this, the assistant seizes it with forceps and draws it forward. The needle is reintroduced at a corresponding point at the opposite edge, and is carried through the peritoneum, fascia, and skin as before. Some surgeons prefer to suture the peritoneum and fascia separately with a continuous catgut suture. This takes a little more time, and is a refinement which should not be practised at the end of a long operation, where the patient's strength is much reduced. However, if the wound is a long one—over four inches—it is a good plan to suture at least the fascial edges separately. As the sutures are introduced, the ends are secured with compression-forceps. They are usually half an inch apart; the mistake is often made of placing them too close together. If there is a thick layer of adipose tissue, it is occasionally desirable either to allow the skin wound to close by granulation, or to drain the adipose layer by a small rubber tube or strip of gauze introduced at the upper and lower angles of the wound. A suture is introduced in the track of the drainage-tube, but it is not tied until after the tube has been removed.

Fig. 40.

Modified Peaslee needle.

For rapid work a modified Peaslee needle (Fig. 40) will be found convenient.

Previous to suturing the fascia the flat sponge is removed, and the surgeon satisfies himself, by inserting a sponge to the bottom of the pelvis, that hemorrhage has ceased. The presence of a small amount of blood or water need cause no apprehension, since it is readily absorbed by the peritoneum.

The assistant now lifts up the abdominal wall by the sutures while they are tied, in order to prevent the omentum from becoming entangled in them. The sutures are tied from above downward, with an ordinary surgeon's knot, sufficiently tight to secure exact coaptation of the edges, but not to strangulate the tissue,—a common cause of suppuration. A few superficial sutures are usually necessary to secure exact union.

The Dressing.—The wound and its neighborhood are now sponged off with bichloride or boiled water, powdered with aristol, boracic acid, or dermatol, iodoform or sterilized gauze is applied, and one or two layers of borated absorbent cotton, the whole being held in position by broad strips of rubber plaster carried over the hips and abdomen. If a drainage-tube has been used, a collar of gauze is placed under it to prevent its being forced down into the pelvis. The strip of gauze is now removed from the tube, in order to note the amount of fluid which it contains. Additional strips are inserted and removed until the tube is dry; it is then plugged with gauze, and its opening is thoroughly covered with gauze dressing secured with plaster. The patient is then dried with warm towels, a many-tailed bandage is applied to the abdomen, and she is removed at once to her bed, hot bottles having been placed in readiness. If she is weak from loss of blood, or collapse threatens, an enema of hot salt solution may be given at once.

The nurse now gives her undivided attention to the patient, and the room is at once cleared, so that there may be no traces of the operation when she recovers consciousness.

Accidents and Complications during Ovariotomy.—1. *Escape of Fluid into the Cavity.*—This was formerly regarded as of serious significance, especially in the case of cysts with thick colloid contents. Most surgeons now consider that it does not add to the danger of the operation. Personally, the writer thinks that it is best to use caution, lest even a small quantity of the most innocent looking fluid enter the cavity, since it is not possible to judge from its macroscopical appearance whether or not it is of an infectious character. In a recent case, in which a cyst of moderate size, absolutely without adhesions, was removed through a two-inch incision, the entire operation occupying less than twenty minutes, two or three drachms of fluid oozed out at the side of the trocar and entered the peritoneal cavity, from which it was promptly removed. The operation was conducted with the strictest aseptic precautions, yet within thirty-six hours the patient developed virulent septic peritonitis, to which she succumbed on the third day. The post-mortem showed that the stumps were healthy; the pelvis contained a quantity of stinking fluid, and there was general adhesion of the intestines, which were covered with flakes of organized lymph. The only explanation which could be given to account for the infection was that a careful examination of the cyst-wall showed that it had undergone necrosis at one point. The fluid was not examined bacteriologically, but was evidently not so innocent as it appeared to the naked eye.

Fluid can be prevented from entering the cavity, even when the patient is not turned upon her side, by seizing the cyst with a hook or forceps as soon as the trocar has been plunged into it, and drawing it out of the wound, the edges of which are compressed by an assistant, who protects the latter thoroughly with hot towels or pads. If fluid escapes into the cavity, unless there is general diffusion of colloid material among the intestines, it is better to sponge than to wash it out, although the writer has had good results by the latter method, even when a large quantity of dermoid material had escaped into the cavity twenty-four hours before the operation.

The question of drainage after irrigation has already been mentioned; it is now practised not so much because of the fact that irrigation has been performed on account of the escape of fluid into the cavity, as because the latter is of a purulent nature, and also because a large raw surface or "dead space" has been left within the pelvis.

2. *Hemorrhage.*—General oozing from the separation of slight adhesions seldom assumes serious proportions, since it may usually be stopped by pressure. Firm adhesions, especially to the intestine, should not be separated by touch alone, but should be divided between ligatures, or by forceps if haste is necessary. Large spouting vessels should be caught with clamps as soon as they are seen. The greatest loss of blood occurs during the removal of malignant tumors. The surgeon should not be appalled by the extreme vascularity of the tissues, but should work rapidly, securing adhesions *en masse* with forceps, first removing the tumor, then quickly sponging out the blood, and, as soon as bleeding points are seen, seizing them with clamps, ligating them at his leisure. In these cases it is desirable to lose as little blood as possible, and haste is an important factor in the success of the operation, to avoid shock. Hemorrhage deep within the pelvis is apt to be most annoying to the inexperienced operator, who sees the blood welling up as fast as it is sponged away, without being able to locate the source of the bleeding. Under such circumstances, elevation of the patient in Trendelenburg's posture gives a most favorable view of the bleeding points. No time should be lost in working through a small incision; the original wound should be rapidly enlarged to six or eight inches, if necessary. The intestines should be held back with towels and flat sponges, and the operator should actually *see* the points from which the oozing occurs. Extensive raw surfaces may often be covered in with a continuous catgut suture passed with a curved needle. This is a procedure which sometimes takes considerable time and patience, but it should not be neglected, since the patient's life may depend upon its proper performance. Persistent venous oozing can usually be checked either by hot-water irrigation or, better, by pressure, the pelvis being packed full of sponges, which are not removed till after the sutures have been inserted. The writer would again caution his readers against relying upon the use of hot water alone for checking hemorrhage: he has frequently seen operators lose valuable time by pouring gallons of water into the abdominal cavity in the attempt to arrest arterial

bleeding, which could be stopped only by finding and ligating the bleeding points.

3. *Injury to Viscera.*—In wounds of the liver the bleeding can be nearly always controlled by pressure or by the use of the actual cautery at a dull heat. Applications of subsulphate of iron have fallen into merited disfavor.

Injuries to the intestine may involve the serous surface alone, or the muscular layer, or may result in complete tearing across of the gut. Extensive losses of tissue are readily repaired by a Lembert suture of fine silk, as are also complete perforations which do not involve more than one-third of its calibre. More extensive injuries of the muscular coat and complete tearing require enterorrhaphy. These are accidents which try the nerve of the operator, who is obliged to prolong the operation often when the patient is already exhausted; but he should not therefore neglect the smallest detail which is necessary to secure safety. The rectum is often wounded during the enucleation of deep intra-pelvic tumors. The opening should be at once closed and a drainage-tube inserted. As a further precaution, the wounded area should be isolated from the rest of the cavity by gauze.

Wounds of the bladder are comparatively rare during ovariotomy, though cases have been reported in which it has been opened. They are closed in the usual manner with a Lembert suture. The wound heals rapidly, and there is little danger of the escape of urine into the peritoneal cavity if a catheter is kept in for a few days.

In peeling off cysts which are adherent to the posterior surface of the uterus, its serous covering is often extensively lacerated, leading to free oozing. The raw surface sometimes requires to be closed with a suture, though the oozing can often be readily controlled with the cautery. The tumor is sometimes so fused with the uterus that it is necessary to remove a portion or the whole of the organ. When supra-vaginal amputation has been performed, the stump is fixed in the lower angle of the wound, and is treated in the ordinary manner. Total hysterectomy is preferable.

By operating in the inclined posture it is often possible to recognize and to avoid the ureter during the enucleation of intra-ligamentous cysts, but the duct is sometimes either torn or cut across, is ligated, or is temporarily grasped with forceps in such a way as to occlude its lumen. If the ureter is actually divided, and the accident is recognized at the time, several courses are open to the surgeon,—either to make an opening into the bladder and to suture the distal end of the ureter to it, to suture the ureter in the lower angle of the wound, or, if this is impossible, to remove the corresponding kidney at once, which has been done in several instances with success. The condition of the patient might contra-indicate the latter heroic measure. Kelly has performed uretero-ureterostomy under these circumstances with the most satisfactory result.

4. *Shock.*—As before stated, in the case of a patient whose strength is much reduced, or when it is likely that the operation will be a long and

severe one, precautions should be adopted to avoid shock by the adminis-
tration of stimulating enemata and the application of hot-water bags to the
chest and extremities; at the same time the patient should receive only
sufficient ether to prevent her from struggling.   Shock during operation is
combated by hypodermic injections of camphorated oil and strychnine and
by rectal enemata of hot salt solution and whiskey.   Irrigation of the
abdominal cavity with hot water has been mentioned.   Infusion of salt
solution should be resorted to in desperate cases as soon as the abdominal
cavity has been closed.

5. *Complications on the Side of the Tumor.*—(*a*) *Intra-Ligamentous Cysts.*
—In these cases the operator is obliged to enucleate or to peel out the cyst
from between the folds of the broad ligament, a procedure the proper per-
formance of which requires a thorough knowledge of the anatomy of the
parts, great delicacy of manipulation, and promptness in dealing with emer-
gencies.   It is often impossible to form a pedicle, so that after the tumor
has been removed there remains only a large bleeding cavity between the
folds of the broad ligament.   Under these circumstances the latter must be
ligated in sections, its upper portion cut away, and the peritoneal edges
turned in and sutured.   It is sometimes good practice to ligate the tube
and upper portion of the broad ligament close to the uterus, to divide
this portion between two ligatures, and then to begin the enucleation from
within outward, tying bleeding vessels as they are divided.   The caution
has already been given to avoid injury to the ureter when working deep
within the pelvis.

(*b*) *Incomplete Operations.*—These will become more rare as the sur-
geon's experience increases.   Many cysts were once regarded as impossible
of removal which are now easily extirpated.   The presence of firm, general
adhesions, of an intra-ligamentous cyst which cannot be enucleated without
extreme shock and loss of blood, or the sudden collapse of the patient in
the middle of the operation, may lead the surgeon to conclude it as rapidly
as possible.   In this case the cyst is emptied, is drawn up into the wound,
as much of the sac as possible is excised, and it is then sutured in the lower
angle of the wound, and is drained with gauze or an ordinary glass tube.
Convalescence is protracted on account of the necessary suppurative process
and consequent granulation, but most patients make a satisfactory recovery,
only they cannot always be regarded as cured.   The writer has succeeded
at a second operation in removing a cyst which he had previously drained
in this way on the supposition that it was impossible to extirpate it.   After
enucleating an intra-ligamentous cyst, the cavity within the broad ligament
is sometimes so extensive that it cannot be closed with sutures.   In this
case it is treated in the same manner as above described,—that is, the peri-
toneal sac is stitched into the lower angle of the wound and is drained
as before.   The method of vaginal drainage presents many advantages,
especially in the case of suppurating cysts firmly adherent to the floor
of the pelvis.

Instead of adopting the combined abdomino-vaginal drainage, practised by Sims, the method suggested by Hanks in the case of suppurating cysts offers many advantages,—that is, to empty and irrigate the sac from above, thoroughly disinfecting it with peroxide of hydrogen, then to carry a rubber or gauze drain through into the vagina. The upper opening in the cyst is then carefully sutured and the abdominal wound is closed. Drainage is perfect, and the treatment of the case resolves itself into that of a simple pelvic abscess.

Special complications in operations on malignant tumors have been mentioned. There is considerable room for the exercise of judgment. The surgeon will be more apt to err on the side of rashness than on that of caution. He should study well the nature, vascularity, and environment of the growth, and note the presence or absence of secondary deposits, before he converts an explorative incision into a radical operation. Having once begun to separate adhesions, there is no retreat; the operation must be finished, frequently at the expense of the patient. It is impossible to lay down any fixed rule, since each case presents individual peculiarities which can be recognized and dealt with only at the time. It may be stated, in general, that the size of the tumor is no criterion of the difficulty of its removal or of the amount of shock that will be experienced by the patient. Small intra-ligamentous cysts, in which at first sight the operation appears simple and uncomplicated, may require more time for their removal and occasion more profound shock to the patient than the extirpation of immense abdominal tumors.

In some cases the cyst may be so firmly adherent to the parietal peritoneum that the line of demarcation cannot be made out. The inexperienced operator may peel off the thickened peritoneum over a wide area under the mistaken impression that he is separating the cyst-wall. In such a case it is better to cut away the flap of peritoneum, since it may become gangrenous.

Numerous cases are on record in which instruments or sponges were left within the peritoneal cavity, the result having been either fatal peritonitis or the escape of the foreign body through the wound or into one of the hollow viscera after a long suppurative process. Theoretically, this accident ought never to occur, as it is a cardinal rule that all the instruments and sponges should be accounted for before the wound is closed. It is usually due to the fact that the responsibility of counting these is shared by several, instead of being left to a single nurse. The writer's plan is never to introduce a sponge into the cavity without calling the attention of both his nurse and his assistant to the fact, and to have each sponge verified as it is removed; but even with these precautions he once left a pad in the cavity. There is no excuse for losing forceps, since only long clamps should be applied. The writer once reopened a wound twice in order to remove a flat sponge which a nurse insisted was still in the cavity: it was subsequently found in a slop-pail. It has been his painful experience

to find no fewer than three sponges in the peritoneal cavity at the post-mortem table, which had been left there by experienced operators. If there is any doubt as to the fact of a foreign body being left behind, the wound should be at once reopened and a thorough search instituted for it. The same advice is applicable whenever the mistake is discovered, even though it be twelve hours or twenty-four hours after the operation. The writer assisted a colleague in removing a small sponge which was found among the intestines eighteen hours after operation, the patient having had no bad symptoms. She made a good recovery.

After-Treatment.—The cardinal principle to be observed in the after-treatment of an ordinary case of ovariotomy is to leave the patient alone as far as possible. Nothing should be given during the first twenty-four hours except an occasional sip of hot water. The rectum may be used for the administration of nourishment or stimulants in the case of patients who are very much exhausted, or when the stomach remains irritable for several days. During the second twenty-four hours a little hot tea, gruel, clam-broth, or beef-extract may be given by the mouth, not more than half an ounce every two hours. Most patients will be able to take milk, either with lime water, sterilized, or peptonized. The objection to milk on account of its tendency to constipate is outweighed by the fact that it is usually retained by the most delicate stomach. If rectal enemata are given, they should not be repeated more frequently than once in five or six hours, the amount being limited to three or four ounces. Beef-extract or sarco-peptones with whiskey and such drugs as may be needed may be given in this way with advantage. The patient may be very much troubled with nausea and vomiting, persisting even for forty-eight hours after operation. The latter is to be carefully distinguished from the vomiting of acute peritonitis, which is not only more violent in character, but consists in the ejection of a quantity of dark-brown or greenish fluid and is accompanied by the other well-known symptoms of this complication. The inexperienced physician as well as the nurse should be cautioned against yielding to the patient's entreaty for cracked ice, since she may continually take it for several hours and then eject the entire quantity of water at once.

No internal medication should be employed, if it is possible to avoid it. The writer believes that the wide-spread objection to opium is not entirely rational. It is, of course, not desirable to administer it freely for the relief of pain, but there is no objection to giving a small hypodermic two or three times after an abdominal section if the patient is unusually restless and sleepless. It also acts well in cases of obstinate vomiting. One-eighth of a grain of morphine with one-hundred and-fiftieth or two-hundredth of a grain of atropine is usually sufficient. Nor has he observed at any time that this checks normal peristaltic movements. The injection should be given only by the direction of the surgeon, not as a routine measure, but exceptionally, when he regards it as especially indicated.

The bowels may be moved on the third or fourth day in a simple case,

though it may happen that there will be no movement before the fifth or sixth. Symptoms of peritonitis indicate an early resort to purgation, as will be stated subsequently. Moderate tympanites alone is no indication, since this can be relieved by the passage of a rectal tube, with the injection of a little turpentine and water, if necessary. It is a good plan to give on the third or fourth day a tablet triturate of calomel, one-half or one-fourth of a grain every hour until six doses have been given, to be followed by teaspoonful doses of a saturated solution of Rochelle salt, continued until the patient feels as if the bowels would move. A similar effect may be produced by administering a rectal enema containing two ounces of a saturated solution of salts, half an ounce of glycerin, and a pint of warm water. This should be given through a soft-rubber rectal tube, introduced high up into the bowel and allowed to enter slowly. The discharge of flatus per anum within a few hours after the operation is regarded as a favorable symptom, showing that the bowel has recovered its normal function and that there is no obstruction.

If the patient can pass her urine she should be allowed to do so from the first; otherwise it may be drawn every six or eight hours for the first day or two. Great care should be used in keeping the catheter absolutely aseptic, in order to avoid the development of cystitis, which is a most annoying complication. The attendant need not be alarmed if the amount of urine secreted during the first twenty-four hours does not exceed twenty ounces; it may be several days before the normal amount is passed.

The former objection to moving a patient during the first few days has been dismissed. She should lie on her back during the first twelve to twenty-four hours, after which she may be turned upon her side and supported in this position by pillows placed behind the back. It is desirable to pass a rectal tube in this position. A small roll of blankets or a pillow is placed under the knees, so as to flex them slightly.

The wound is not disturbed until the eighth day, when the dressing should be changed, with aseptic precautions, and the wound cleansed and carefully examined. Many surgeons remove the sutures at this time; it is probably better to leave some of them for two or even three weeks, especially if silkworm-gut is used. Induration at the site of the sutures, or the development of a mural abscess, would, of course, require the prompt removal of the offending ones.

The patient should be kept in bed at least two weeks, and longer if complications have arisen, such as mural abscesses, pelvic exudates, etc. She should be provided with a properly fitting abdominal bandage, to be worn as soon as she leaves her bed; the plaster and the light dressing over the wound may be employed for two weeks longer. If she can be persuaded to remain in bed for three weeks, so much the better. The bandage is to be worn for six months or a year after the operation, especially if there is a weak spot at the lower angle of the cicatrix, due to the use of a drainage-tube.

Complications after Ovariotomy.—*Shock.* — This is the first danger to be overcome. It usually follows a severe operation in a weak patient in whom a cyst has been enucleated or many adhesions separated. It is common after the removal of malignant tumors. The immediate treatment of shock consists in the application of heat by hot-water bottles (especial care being taken that they are carefully covered, so as not to burn the patient), stimulating enemata, and hypodermic injections. The writer cannot forbear repeating the caution which he has frequently given against the too frequent and indiscriminate resort to hypodermic stimulation. Great care should be used in the administration of such powerful alkaloids as strophanthin, digitalin, nitroglycerin, strychnine, etc. Of these, strychnine is probably the safest. It may be given in doses of one-sixtieth to one-fortieth of a grain, repeated every two or three hours until one twentieth or one-fifteenth of a grain has been given. The hypodermic injection of alcohol in any form, or of ether, is not to be commended. It frequently gives rise to painful indurations or abscesses which annoy the patient more than the operation itself. The desire to obtain an immediate effect in these cases may lead an inexperienced surgeon to over-stimulate the already exhausted heart. Hot beef-tea and whiskey, or hot saline solution given per rectum, are both safe and efficient means of combating collapse. Sterilized camphorated oil, one part in four or five, injected deep into the muscles of the thighs, is a powerful stimulant, and, if given through a *clean* needle, causes no irritation. In every case time should be given the patient to recover from the shock, which may last for twenty-four or thirty-six hours.

Hemorrhage.—So-called "secondary hemorrhage" after abdominal section is really primary, being due either to the slipping of a ligature or to persistent oozing. The writer has called attention to the increased danger from the latter cause when the operation has been performed in Trendelenburg's posture. It is now his practice to lower the patient to the dorsal position before inserting the sutures, and to satisfy himself before closing the abdomen that the venous return consequent on the change of posture has not given rise to fresh bleeding.

The diagnosis of hemorrhage is not difficult when a drainage-tube has been used, because bright-red blood then wells up through the tube in such quantity as to leave little doubt as to the existence of the accident; but when no tube has been used, and the operation has been long and difficult, it is sometimes extremely difficult to distinguish between prolonged shock and progressive hemorrhage. The experienced surgeon will judge of the presence of hemorrhage in these cases by the general appearance of the patient, the increasing pallor, the cold extremities, the rapid respiration, and the fact that her pulse, instead of responding to stimulation, continues to grow more feeble. The writer has had occasion to reopen the cavity in several instances,—twice in his own practice,—and was only once led into error in the diagnosis by depending on these signs.

It is manifest that if anything is done it must be done promptly,—that is, within an hour or two after the operation. In the only instance in which the writer succeeded in saving the patient the wound was reopened within less than an hour. If there is any doubt, one or two stitches at the lower angle of the wound should be cut and its edges pulled apart, when the fresh blood wells up into the opening. Almost every abdominal surgeon has had deaths from this cause, but they should become more and more rare as greater care is exercised in the ligation of the pedicle and in the checking of hemorrhage before the abdomen is closed. It is sometimes difficult to distinguish between serious hemorrhage and the moderate oozing which not infrequently follows complicated operations : the latter, however, does not produce that profound effect upon the patient's pulse and general condition which is invariably observed in the case of active hemorrhage.

The secondary operation, although done hastily, should be performed, so far as possible, with strict aseptic precautions, since it is always to be hoped that the patient may recover, and that sepsis will not be introduced in consequence of reopening the abdomen. There are few emergencies which call for more promptness and coolness on the part of the operator. In this respect it is comparable to operations for ruptured ectopic gestation, although it is really of a more serious nature, since the patient is subjected to a second abdominal section immediately after the first. No time should be lost after opening the abdomen in seizing the pedicle, drawing it up into the wound, and seeing if the ligature has slipped : if it has, the stump should again be transfixed and tied in the usual way, after which the cavity is irrigated with hot salt solution, is quickly sponged dry, and is closed again. If it is impossible to locate the source of bleeding, a firm gauze tampon should be introduced.

The ordinary treatment followed after post-partum hemorrhage is then indicated,—stimulating rectal enemata and the infusion of saline solution. The subcutaneous injection of the same solution has been employed with good results. It is better to give the patient a few whiffs of chloroform in order to husband her strength, but it may be necessary to operate without an anæsthetic.

Peritonitis.—This was once the great dread of the abdominal surgeon, who distinguished a traumatic as well as a septic variety. A localized, non-septic peritonitis probably accompanies many severe operations in which numerous adhesions have been separated, but this possesses little significance as compared with the peritonitis which is a result of sepsis. It may be an acute form, developing within thirty-six or forty-eight hours, possibly after an operation which may have been aseptic, but in which a small quantity of irritating fluid has been left in the cavity. Great stress was formerly laid upon high temperature ; this is now regarded as the least important sign. It may not rise above 101° F. until just before death. The heroic measures formerly taken to reduce fever after ovariotomy have all been abandoned. We now aim at treating the cause, *not* the effect.

Cold sponging and the ice-cap are usually sufficient to keep the patient comfortable. The cold pack has been employed with good results. The pulse is a much more reliable evidence of trouble, added to a peculiar facies which to the experienced surgeon is an unfavorable indication even in the absence of other symptoms. Persistent vomiting after entire recovery from the anæsthetic, with distention of the abdomen, and a small, wiry, rapid pulse (120 to 140), point to a very grave condition, in which the prognosis is most unfavorable. However, the surgeon should by no means abandon hope, since cases which are apparently rapidly progressing to a fatal termination may suddenly take a favorable turn under prompt and efficient treatment. The cardinal rule is to suspend the administration of everything by the mouth, nutrient enemata being given every five or six hours. Immediate attempts should be made to move the bowels by laxatives, if possible; if not, by a high enema of turpentine and saturated solution of salts. As regards the administration of morphine under these circumstances, the pendulum has swung somewhat in the other direction. It is still regarded by many as absolutely contra-indicated, yet this is doubtless an extreme view, since a full dose of morphine may relieve the shock to the splanchnic plexus, which is a possible cause of the paralysis of the bowel, and thus actually assist the action of the purgative. In cases of obstinate vomiting of a large quantity of fluid, lavage of the stomach has been employed with benefit. It is probable that some cases of intestinal obstruction are really due to toxæmia. These are cases in which prompt relief follows the free movement of the bowels. It is doubtful if septic peritonitis is ever arrested in this way.

After attempts at moving the bowels have been continued for thirty-six or forty-eight hours without success, and it is evident that the patient is growing rapidly worse and the tympanites increasing, with persistent vomiting, whether fæcal or not, the surgeon should not hesitate to reopen the lower angle of the wound, and to wash out the abdominal cavity with boiled water, breaking up such adhesions as exist and evacuating all collections of pus or serum, and inserting a drainage-tube. Recovery has followed this treatment, though the chances are desperate.

Intestinal Obstruction.—This may be immediate or secondary. Acute obstruction may be due to the simple adhesion of a loop of gut to a raw surface on the abdominal wall or within the pelvic cavity. Under these conditions, reopening the abdomen and separating the loop may be successful; but the adhesive inflammation is more often of septic origin, and the prognosis is doubtful. The element of shock in secondary cœliotomy is one which seriously affects its success. Chronic obstruction may occur several weeks or months after ovariotomy, following adhesion of the gut to the wound or abdominal parietes, or imprisonment by bands of organized lymph. The obstruction is recognized not merely by the presence of obstinate tympanites, but by the non-passage of flatus or intestinal contents, by localized pain, violent and limited peristalsis, and obstinate vomiting, which

may or may not be fæcal. The surgeon who waits for fæcal vomiting in these cases before operating usually waits too long.

Renal Complications.—Renal complications following ovariotomy are among the most severe with which the surgeon has to deal. These may vary from simple insufficiency, which yields to treatment within forty-eight hours, to actual suppression and uræmia, which may terminate fatally on the second or third day. The use of chloroform instead of ether may prevent these to some extent, but not absolutely. Where the surgeon has recognized before operation, as he should have done, the presence of kidney-trouble, he will be on the lookout for the first manifestation afterward. The amount of urine secreted must be carefully noted, and it should be daily examined by a competent observer for albumin and casts. In cases in which it has been necessary to enucleate intra-ligamentous cysts, ligation of the ureter may be suspected. It is difficult to recognize this, especially if the patient has had no symptoms referable to the affected kidney. Simple diminution of the amount of urine without change in its character may awaken anxiety, but if the patient's general condition is good and her pulse not rapid or of high tension, we should not be in haste to adopt heroic treatment. Suppression, partial or complete, a rapid, high-tension pulse, a rise of temperature, dry tongue, and great restlessness, with or without delirium, are serious indications, which must be met by prompt treatment,—that is, by the use of hot poultices, local stimulation and dry cupping, a calomel purge, diaphoresis with hot packs, the free administration of fluids, the withholding of stimulants, and the giving of small doses of nitroglycerin, and especially of the fresh infusion of digitalis in half-ounce doses, every six hours, either by the mouth or by the rectum.

It is important to distinguish cases of uræmia from those of acute sepsis, since many of the symptoms are similar, especially the rapid elevation of temperature and increase in pulse-rate, with or without distention of the abdomen. The previous history of the patient and a careful examination of the urine will generally give a clue to the true condition.

Cardiac Complications.—Some patients in whom no organic cardiac lesion can be detected may have a rapid, feeble heart-action, continuing for several days after the operation, even if the latter has not been specially severe. The writer has known a case in which the pulse remained at 150 to 160 for a week or ten days without any other unfavorable symptoms, the patient eventually making a good recovery. There was a strong hysterical element in this case. The possibility of the latter factor should always be borne in mind, since it may save the surgeon much anxiety. In the writer's experience, patients with valvular disease of the heart usually do well after ovariotomy, though the possibility of complications from this source should always be borne in mind.

Pulmonary Complications.—Acute bronchitis and pneumonia may follow the administration of ether. In most of the cases which have come under the writer's observation the patient was allowed to take cold from being

imperfectly covered either during the operation or immediately afterward. Special attention should be directed to protecting the chest with a flannel sack when she is on the table and after she has been placed in bed.

Other less frequent complications are parotiditis, tetanus (which is extremely rare in this country), acute mania, and various vascular disturbances, such as thrombosis and embolism, a fatal case of the latter having been reported by Thornton. Among the later complications are ulceration and perforation of the intestine, which may be due either to the pressure of the drainage-tube or to sloughing of a loop of gut the serous covering of which has been stripped off while separating adhesions. Fortunately, perforation generally occurs in the track of the tube, and thus leads to a temporary, more rarely a permanent, fæcal fistula at the lower angle of the wound.

Among the annoying sequelæ of ovariotomy are indurations and abscesses around the pedicle, which not only retard convalescence, but may lead to subsequent adhesions and persistent pelvic pain. Absolute asepsis of the ligature and careful disinfection of the pedicle, especially by means of the cautery, will minimize the risk from this source, but it is impossible to prevent it entirely.

It has been asserted that the use of catgut ligatures avoids the complications which may result from the employment of silk; but most surgeons still prefer to take the risks of subsequent irritation of silk rather than those of hemorrhage from slipping of the pedicle. In an aseptic operation the ligature is encysted, and may remain *in situ* for several years. The writer found one perfectly preserved two years after a former operation. Trouble is less apt to follow from this source in ovariotomy where the pedicle is aseptic than in suppurative disease of the ovaries and tubes, when it may be necessary to leave diseased tissue in the stump.

Mural Abscesses.—This complication is usually more annoying than dangerous, although cases are on record in which such abscesses have ruptured into the peritoneal cavity with fatal result. They may be due to several causes,—primarily sepsis. Theoretically they should not occur, but practically every surgeon meets with them under circumstances in which they appear unaccountable. They are due not only to imperfect cleansing of the skin at the site of the incision and to the use of unclean needles and sutures, but to tying the sutures too tightly, to undue handling or bruising of the edges of the wound, to prolonged compression of masses of tissue with forceps, and, above all, to the contact of septic material. The latter cannot always be prevented, neither can the infectious material be entirely removed by careful sponging with a weak antiseptic solution.

The formation of a mural abscess is usually manifested within from five to eight days after the operation. It may give rise to so much systemic disturbance that the operator will believe that he has to do with general sepsis; the temperature may be elevated to 103° or 104° F., the pulse being rapid and wiry; the patient has local pain, and yet her facies, the absence of

tympanites, vomiting, etc., prove that general infection is absent. Examination of the wound may show a normal appearance, but careful palpation of its edges reveals one or more indurations at the site of the sutures. The offending suture should be promptly removed and the pus evacuated either through the needle-puncture or by separating the edges of the wound over it. It is not necessary to remove all the sutures unless there is general induration. Threatening abscess may be averted by the use of an ice-bag, or, better, warm carbolized compresses. The abscess, after evacuation, should be syringed out with a solution of peroxide of hydrogen, full strength, packed with iodoform gauze, and later treated with balsam of Peru to promote granulation. If there is general induration of the wound, it is good practice to lay it open down to the fascia, which will have united firmly by the seventh or eighth day, and to break up all the purulent foci, so as to allow it to granulate from the bottom. Convalescence may be protracted two or three weeks on this account, but the resulting cicatrix is often firm and unyielding, so that under proper treatment there is even less danger of ventral hernia than when the healing has been by first intention. A fistulous track at the site of the drainage-tube is apt to occur if the latter is allowed to remain too long, or if proper care is not exercised in keeping it absolutely aseptic. The fistula may persist for weeks or months. Under these circumstances the surgeon should suspect that there is a foreign body at the bottom of the wound, such as an infected ligature, and should keep the fistula open until the latter either has come away or can be reached and removed. This is a rare complication after simple ovariotomy. If the upper portion of this track is allowed to close over, pus may accumulate at its bottom, constituting a true pelvic abscess and requiring a second operation. Sometimes it is necessary to establish a counter-opening in the vagina before the abdominal fistula will close.

Ventral Hernia.—Every abdominal surgeon who follows up his cases must acknowledge that this accident occurs in the practice of even the most experienced. Those who deny the imputation are apt to be corrected by their surgical *confrères* who have occasion to operate upon patients reported as permanently cured. Ventral hernia is in effect a separation of the wound, more or less extensive. This separation occurs in the fascia, and may be due to several causes,—either to imperfect closure of the wound at the time of the operation, or to imprudence on the part of the patient, who has neglected the caution to avoid undue exertion for a sufficient period after operation and to wear an abdominal bandage for at least a year. The use of a drainage-tube, especially if the edges of the wound are not brought together immediately after its removal, leaves a weak spot which is very apt to become the seat of a small hernia. More extensive hernia results in wounds six or eight inches in length, in which the surgeon has not taken the precaution to bring the fascial edges into exact apposition, or to suture peritoneum, fascia, and skin separately.

The treatment of this complication need not be described here; it is

sufficient to say that there is only one radical cure,—that is, to reopen the abdomen, to excise the old cicatrix, separating all omental and intestinal adhesions, and to close the wound with four layers of sutures, one including the entire thickness of the wall, and a separate set each for the peritoneum, the fascia, and the skin. Any treatment less radical than this is almost certain to result in failure. This secondary operation is not always an easy one, especially if there are firm parietal adhesions.

Among the later complications of ovariotomy may be the development of a cyst on the opposite side, where an apparently healthy ovary has been left. The possibility of this occurrence should lead the surgeon to remove the second ovary if there is reasonable doubt as to the presence of cystic degeneration ; provided, of course, the patient so desires. In the hands of the experienced surgeon, a second or even a third abdominal section offers no special difficulties ; but the beginner should remember that it is very common to find the omentum or intestine adherent to the old cicatrix, which is also quite thin, so that an incautious use of the knife might result in injury to the gut. Some surgeons make their incisions a little to one side of the original cicatrix. A better practice is to begin the incision above, and to open the cavity at this point, so that adherent gut or omentum lower down may be detected at the outset.

Some mention should be made of the phenomena observed after the removal of both ovaries, especially in young women. Among these are :

(1) *Persistent Metrostaxis or Pseudo-Menstruation.*—The writer has two cases now under observation in which a flow has recurred at regular intervals for upward of a year, unaccompanied by pain. In both instances an induration exists around one of the stumps. The attempt to refer the hemorrhage in these or any other cases to the presence of a third ovary is unscientific. The writer is fully in accord with Sutton in his statement that there is no authenticated instance on record of a third ovary. He has been able to explain persistent hemorrhage in all the cases which have come under his observation on the theory that a portion of ovarian tissue was left in the pedicle, that pelvic congestion was induced by the presence of adhesions or indurations, or that the uterus remained enlarged and congested in consequence of displacement, endometritis, or the presence of a fibroid.

(2) *Vaso-motor disturbances* are exceedingly distressing in a certain proportion of cases. They are the phenomena commonly observed in connection with the normal menopause, and may last from a few months to two or three years. There is no medicinal treatment which is capable of general application.

It is hardly necessary now to call attention to the exploded idea that double ovariotomy necessarily causes any change in the sexual condition, such as atrophy of the breasts, loss of sexual appetite, etc. The latter is either unaffected or increased ; in a few instances it may be diminished or lost. Obesity is often observed, though usually in women who have a

tendency in this direction.   In general, it may be stated that the opinion of Sir Spencer Wells agrees with the observation of other ovariotomists, that those patients who recover from ovariotomy are permanently cured.

NEOPLASMS OF THE TUBES.

These possess more pathological than clinical interest, not only because of their rarity, but by reason of the fact that they seldom attain such a size as to be recognized as distinct tumors.   When we reflect that the tubes are simply prolongations of the uterus, their walls being identical in structure, it would appear strange that they are not more frequently the seat of similar morbid growths, especially as they are so subject to inflammatory conditions which in other organs have been regarded as an etiological factor in the production of neoplasms.   As in all fibro-muscular tissues, simple hypertrophy of the tubal wall must be carefully distinguished from a true neoplasm.   Primary malignant growths are especially rare, while secondary involvement is less common than would be supposed, considering the relative frequency of malignant disease of the uterus and ovaries.

Tubal neoplasms fall naturally into the two subdivisions benign and malignant.   The former are, in the order of their frequency, adenomata, fibro-myomata, cysts, and lipomata.

BENIGN NEOPLASMS.

Adenoma.—Since Sutton has settled the much-disputed question of the presence of glands in the mucous membrane of the Fallopian tube by proving from his studies in comparative anatomy that the depressions

FIG. 41.

Papilloma of the tube. (Doléris.)

between its folds in the oviduct of the human female are to be regarded as true glands, it is a natural inference that adenomata can develop from them just as in the endometrium.   Doran was the first to describe a true papil-

lary adenoma of the tube, and two or three other similar specimens have since been examined. The tube was considerably enlarged, and was filled with a cauliflower-like mass, which in one instance protruded from the distal end in the form of a number of vesicular bodies. These papillomatous and

FIG. 42.
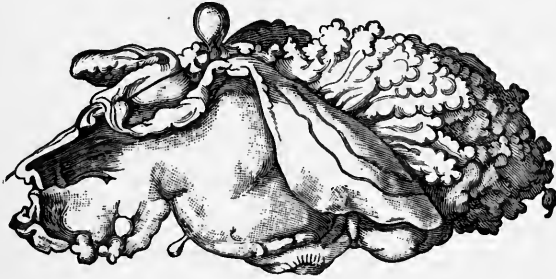
Papillary adenoma of Fallopian tube. (Doran.)

vesicular masses sprang directly from the mucous membrane. Under the microscope the growths presented the ordinary anatomical structure of adenoma. A peculiar clinical feature of these cases is the fact that hydro-peritoneum was present, the fluid having been derived from the tube; there was no reaccumulation after removal of the latter. The similarity between the condition and the ascites accompanying papilloma of the ovaries and peritoneum will be at once apparent. It is evident that this affection must be distinguished from hypertrophy of the tubal mucous membrane, which is sometimes seen as the result of a chronic catarrhal salpingitis.

Fibro-Myoma.—As before stated, the infrequency of fibroid growths as compared with those of the uterus is quite remarkable. Sutton calls attention to the fact that hyper-trophy of the muscular wall of the tube often accompanies general fibroid degeneration of the uterus; but this is, of course, entirely differ-ent from a true neoplasm. Fibro-mata or fibro-myomata of the tube are usually not larger than a marble, so that they rarely possess a clinical interest. Simpson's reported case, in which the tumor was said to have been as large as a child's head, is viewed with considerable suspicion.

FIG. 43.

Fibro-myoma of tube. (Museum of the College of Physicians and Surgeons.)

Spaeth reports a more reliable case in which the enlargement was about two inches in diameter. These little growths are usually subserous, some-times pedunculated, but interstitial nodules have been described. Micro-

scopically, they show a predominance of the muscular over the fibrous tissue.

Cysts.—These are insignificant in size, never larger than a walnut, and usually much smaller. They may readily be mistaken for cysts in the mesosalpinx, to which reference will be made subsequently. They may exist either beneath the serous covering of the tube or within the muscular wall. The little vesicular bodies not infrequently seen in the tubal mucous membrane of the ampulla suggest either an inflammatory origin or possibly a retention of the secretion of the simple tubules, as seen in the familiar *ovula Nabothi*. The subperitoneal cysts, which are sometimes pedunculated, have a lining of epithelium (rarely ciliated) and contain a clear mucous fluid. They may rupture spontaneously like hydatid cysts. Sutton refers to a cyst the size of a walnut within the muscular wall of the tube, the description of which corresponds with the "atheromatous cyst" found by Faye in a similar situation. A form of cyst found by Kiwisch in the submucosa was probably of inflammatory origin; in fact, it would seem as if this were the explanation of all the cysts situated in the muscular layer of the tube.

Lipoma.—Fatty tumors are so rare as to deserve only a passing mention. Such a growth the size of a walnut has been described by Rokitansky.

MALIGNANT NEOPLASMS.

Cancer.—The fact that the tubes often remain unaffected in cases of advanced malignant disease of the uterus and ovaries is one that has been commented upon by pelvic pathologists. True metastasis through the lymphatics has rarely been observed. When the tubes are secondarily affected, it is nearly always by direct extension from the corporeal endometrium, but even this occurs less often than one would suppose, —according to Kiwisch, in one-fourth of the cases of diseases of the uterine body. Orthmann has collected only four cases in which it extended from the ovary to the tube. Until a few years ago the possibility of the development of primary epithelioma of the tubal mucosa was denied, but now at least five authentic cases have been reported. The development of the disease and the consequent enlargement of the tube result in an appearance similar to that observed in adenoma.

FIG. 44.

Carcinoma of right tube and ovary.—*a*, cancerous nodules in ovary; *b, b*, nodules in tube. (Winckel.)

The histological appearances are identical with those of epithelioma of the corporeal endometrium. According to Henning, medullary cancer may develop in the submucosa or beneath the peritoneum and may extend to the muscular tissue. He doubtless refers to secondary nodules, such as those figured by Winckel. (Fig. 44.)

Sarcoma.—Primary sarcoma of the tube is still more rare than cancer, not over three or four authentic cases having been thus far recorded. A specimen presented by Dr. J. E. Janvrin to the New York Obstetrical Society was thus described by the pathologist: "The general histological construction of this newly-developed tissue would argue against its being classified as an inflammatory growth, but would place it among the mixed connective-tissue growths. Owing to the large variety of histological elements found, it is impossible to give it any single name which will in any adequate manner express the condition. It may well be classed under one of two headings,—either as a composite fibro-sarcoma or a composite myxosarcoma, the latter being the more accurate of the two."

Symptoms and Diagnosis.—It may be stated that in all the cases of neoplasms of the tube above described the true condition was unsuspected, having been found either at the time of operation or post mortem. Even in cases of secondary involvement in connection with general malignant disease of the pelvic organs a diagnosis must be made rather by inference than from any positive evidence, since there is always such a formation of adhesions as to obscure the outlines of the affected tubes. In cases in which fibromata were situated in the tube it would be practically impossible to decide that this was their primary seat. No characteristic symptoms have been noted, except in Doran's case of primary cancer, which gave rise to a peculiar sanious discharge, while curettage demonstrated the fact that the endometrium was healthy. Malignant disease of the tube usually develops after the primary affection in the uterus has made considerable progress, and pursues a slow course. Enlargement of the tube would be evident on examination, yet, from the accompanying inflammation of the mucosa, it would be difficult to distinguish it from ordinary salpingitis. The phenomenon of ascites before referred to might serve as an indication of more serious trouble.

Prognosis.—The benign neoplasms are of insignificant importance, if we except adenoma, in the few cases of which the accompanying ascites indicated a condition of irritation which might lead to serious consequences, aside from the resulting perisalpingitis. In primary malignant disease of the tubes the prognosis is absolutely unfavorable, since its fatal termination is merely a question of time. Secondary involvement of the tube in cancer of the uterus and ovaries presupposes a stage of advancement of the disease at which operative interference is hopeless. Primary tuberculosis of the tubes is a serious affection, since it tends to extend to the peritoneum. When they remain localized, the tuberculous masses may break down to form abscesses, which either rupture with a rapidly fatal result from peritonitis, or, if the pus remains encapsulated, eventually exhaust the patient. If secondary to pulmonary or general tuberculosis, they simply increase the hopelessness of this condition. (See Chapter VII.)

Treatment.—The indication to extirpate the diseased tubes is clear, except in advanced malignant disease, when the general affection of the

pelvic tissues contra-indicates it.   That the adnexa should be removed, if possible, in all cases in which the uterus is extirpated for malignant disease of the corporeal endometrium, whether primary or secondary to cancer of the cervix, is self-evident.

NEOPLASMS OF THE BROAD LIGAMENTS.

The following neoplasms may develop primarily within the folds of the broad ligament, especially in that portion between the ovary and the tube known as the mesosalpinx : cysts, fibro-myomata, lipomata, and sarcomata. It has been stated that dermoid cysts have been found within the broad ligament which had no connection with the ovary, but their independent origin in this region seems extremely doubtful.

PAROVARIAN CYSTS.

The parovarium consists of a row of parallel blind tubules radiating from the paroöphoron to join another tubule which extends at right angles to them.

Three distinct parts have been distinguished in the parovarium : Kobelt's tubes, the vertical tubes, varying from five to fifteen in number, and the one at right angles to the latter, which represents the remains of Gärtner's duct.   Kobelt's tubes, which usually number four or five, are free at one end, while at the other they spring from the outer extremity of Gärtner's duct.   From these develop certain small pedunculated cysts, to be distinguished from the hydatid of Morgagni (*q. v.*), which are of no importance clinically.   Parovarian cysts proper originate in the vertical tubules, are nearly always non-pedunculated, and present certain peculiarities which clearly distinguish them from intra-ligamentous ovarian cysts.   (Fig. 1.)

It is a peculiar fact in regard to these cysts that they do not seem to develop until puberty, due possibly, as Sutton suggests, to the stimulation which the parovarium receives at this time.   The writer is inclined to accept this theory, since it agrees with the fact which he has noted in several instances, that these cysts often develop after the removal of an ovarian tumor, in cases in which the presence of continued pelvic congestion is indicated by persistent menorrhagia.

Parovarian cysts are more common than was formerly supposed, though the writer does not agree with Sutton in estimating their relative frequency at ten per cent.   The opinion expressed by earlier writers that they seldom exceed the size of the fœtal head at term is erroneous, since all operators agree that they may attain considerable dimensions, so as to contain several quarts of fluid.   There is no doubt that before these growths were carefully studied the " unilocular" cysts of the ovary which were mentioned in 'former monographs were really of parovarian origin.   Polycysts of the parovarium have been described by Bantock and Tait, but, if they occur at all, they must be exceedingly rare, and must be due to the simultaneous enlargement

of adjacent tubules. They are in no way comparable with multilocular ovarian cystomata. The reader is safe in inferring that a true unilocular cyst is parovarian.

Papillary parovarian cysts sometimes occur histologically similar to those which spring from the paroöphoron, and invest these neoplasms with

FIG. 45.
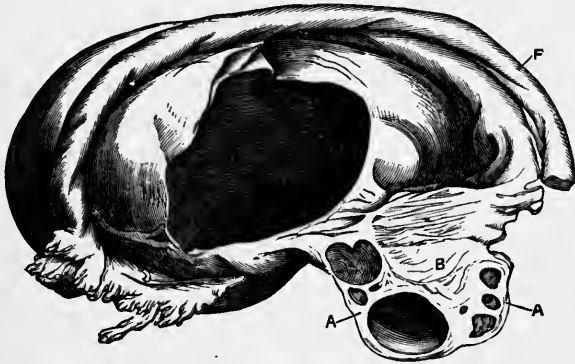
Cyst of the parovarium, showing its relation to the ovary and tube.—*A*, oöphoron ; *B*, paroöphoron ; *F*, Fallopian tube. (Sutton.)

a clinical importance far greater than was once assigned to them, as will be explained subsequently. Parovarian cysts, whether small or large, present certain distinct anatomical characteristics with which every operator should familiarize himself. Since they grow between the folds of the broad ligaments, they are entirely enveloped in a delicate layer of peritoneum, which is freely movable over them and can be easily stripped off, as peritoneal adhesions are rare in connection with these formations. The relations

FIG. 46.
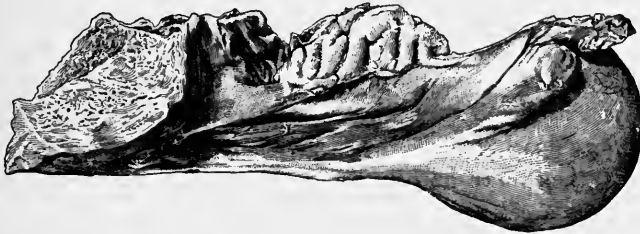
Small parovarian cyst. (Museum of the College of Physicians and Surgeons.)

of the tube and ovary to the cyst are important. They are at first entirely distinct, but as the cyst enlarges, separating the layers of the mesosalpinx, the tube stretches over its anterior surface and becomes closely united with it, the fimbriæ remaining distinct, while the ovarian fimbria may be greatly enlarged. The tube is necessarily elongated with the growth of the tumor, and has been found as long as sixteen inches and quite slender. The peculiar relation of the tube is explained by the fact that the outer and

inner edges being fixed by the uterus and tubo-ovarian fold respectively, it cannot unfold laterally, but only in the middle; hence the stretching of the portion which lies between these points.

The ovary is often found unchanged below the cyst, though it, too, may be so stretched and compressed by the growing tumor as to be almost indistinguishable except as a localized thickening on the cyst-wall. When the atrophied gland is incised, however, its identity will be disclosed by the presence of the characteristic cortex and Graafian follicles.

The walls of these simple cysts are very thin, and are composed of connective tissue with some smooth muscular fibres. They are lined with a layer of columnar epithelium which is sometimes ciliated in the smaller cysts; but it may be cubical, or stratified, or may atrophy and disappear entirely in the larger cysts, as the result of long-continued pressure. Small warty prominences or papillæ not infrequently spring from the inner surface; these must be distinguished from the papillary masses to be described.

A typical parovarian cyst-fluid is limpid, often opalescent, with an average specific gravity of 1005; it has a neutral or a slightly alkaline reaction, and contains less albumin than the fluid from an ovarian cystoma. The statement that albumin and paralbumin are entirely absent is not susceptible of general application, and should not be relied upon for differential diagnosis. We often find merely a trace, however. Admixture of blood, degenerative changes within the cyst, etc., may so modify the appearance and chemical composition of the fluid that it is no longer characteristic. Few formed elements are discovered under the microscope, save an occasional epithelial cell or red blood-corpuscle. Ciliated epithelia are not confined to parovarian cysts, hence their presence has no great diagnostic value. Suppuration is extremely rare. Briefly, a parovarian cyst would be distinguished from an ovarian cyst at the operating-table by the following peculiarities: the peritoneal coat is easily detached, the ovary is distinct and not involved, even though greatly atrophied, the cyst is unilocular and contains a limpid fluid with low specific gravity and only slightly albuminous. The Fallopian tube crosses the anterior surface of the cyst and is closely attached to it; in short, there is no distinct mesosalpinx, as in the case of an ovarian cyst.

The various accidents and degenerative changes described in connection with ovarian cysts rarely affect those now under consideration. Adhesions are particularly rare, and suppuration occurs only in consequence of septic infection from tapping. Spontaneous rupture is probably of not infrequent occurrence, but as the fluid is non-irritating and escapes between the layers of the broad ligament, it is readily absorbed without bad consequences. Spontaneous cure after rupture should be regarded as the exception rather than the rule, and does not furnish a valid argument in favor of tapping *versus* a radical operation. In spite of the absence of a distinct pedicle, a parovarian cyst may suffer axial rotation, and may even become entirely

detached. Its vascular supply, being derived largely from its peritoneal covering, is sufficient to prevent any danger of gangrene. Papillary cysts of the parovarium may be readily mistaken for similar growths develop-ing from the paroöphoron, which they resemble histologically. When the ovary is entirely distinct and unaffected, the origin of the cyst is clear ; but if the papillary growths are closely associated with the hilum, only a careful microscopical study of the specimen will enable the pathologist to decide. The papillary masses grow from the inner wall of the cyst ; if the latter ruptures, they readily invade the peritoneum, both visceral and parietal, as previously described. The question of the possible malignancy of these secondary growths has already been discussed.

Clinical History and Diagnosis.—It will be inferred from what has been said concerning the comparative innocuousness of these growths that they seldom give rise to serious symptoms, except as they furnish a starting-point for the development of general papillomatous outgrowths on the peritoneum. There is no rule as to rapidity of growth. Cases have been reported in which such cysts attained a noticeable size within six weeks, others in which they had existed for as many years without growing any larger. While still small and intra-pelvic, they simply displace the uterus to the opposite side of the pelvis, causing dysmenorrhœa and menor-rhagia. The patient has no sense of discomfort, and is unaware of the existence of the tumor. As it rises into and fills the abdomen, it may cause the disturbances noted in connection with uncomplicated ovarian cysts, due to mechanical pressure on the viscera,—dyspnœa, palpitation, disturbance of the alimentary tract, etc. Emaciation is rare; in fact, the general health is usually perfect so far as the effect of the tumor is concerned.

The diagnosis of cyst of the broad ligament offers few difficulties during the early stage. Its position on one side of the uterus, in the median plane of the pelvis, distinguishes it from cysts of the tube and ovary, which lie behind the broad ligament or in Douglas's pouch. From collections of pus or blood within the folds of the broad ligament it is distinguished not only by the absence of febrile symptoms, but by its symmetrical outline and distinct fluctuation. The introduction of an exploring needle per vaginam, under strict aseptic precautions, would give a clue to the character of the cyst. After it has attained the size of a man's head, it is not easy to distinguish it from an ovarian tumor. The fact that it is a symmetrical monocyst of slow growth, with a thin wall, and with a distinct wave of fluctuation transmitted freely in every direction, especially through the vaginal vault, the uniformity of the cyst, and the absence of semi-solid portions, are, of course, important negative evidences. Non-impairment of the general health in a patient who has had a tumor for several years argues in favor of a parovarian rather than of an ovarian cyst, since the latter generally leads to complications which occasion pain and various disturb-ances of a more or less serious nature.

A thin-walled monocyst which fills the abdomen is commonly mistaken for ascites. A careful review of the history of the case and the application of the rules already laid down for distinguishing this condition from ovarian cystoma should prevent error. It should be noted that hydro-peritoneum may coexist with a papillary cyst and thus mask the true condition, which is recognized only after the ascitic fluid has been withdrawn. It is, of course, impossible to distinguish clinically (even at the operating-table) the origin of such a cyst.

Treatment.—*Palliative.*—Arguing from the well-known fact that broad-ligament cysts often rupture spontaneously and do not refill, tapping was formerly recommended as the proper treatment. Such a course is now regarded as opposed to the spirit of modern surgery. A small cyst of this character, not larger than an orange, may be safely aspirated per vaginam, and it may not refill; the same may be true of a large one which can be reached in the same way. But a small cyst may just as well be let alone, and a large one should be removed. In short, it is better not to tap any cyst, unless for purely diagnostic purposes, for the following reasons. We can never be absolutely certain of the character of a neoplasm until the abdomen is opened. The probabilities are that it will refill, and the tapping may convert a simple into a complicated case by setting up a localized peritonitis. Again, the cyst may be papillomatous, when tapping would simply hasten the dissemination of the outgrowths previously confined to the cavity of the cyst.

Radical.—The removal of a parovarian cyst is simple or difficult according as there is a pedicle developed or not. Under the former condition, the technique is precisely the same as in an ordinary ovariotomy; but if the cyst is intra-pelvic and sessile, and especially if it has burrowed downward between the peritoneal folds to the base of the broad ligament, the indication is to split the broad ligament and to enucleate the cyst in the manner which has already been described. This is often an exceedingly delicate and difficult manœuvre, so that if the operator is inexperienced he would be wiser not to attempt it, since he exposes the patient to the risks of shock and hemorrhage for the removal of an innocuous neoplasm. After enucleating the cyst, the base of which often dips down to the floor of the pelvis, and ligating bleeding vessels, the best way is doubtless to excise the redundant portions of its peritoneal covering and to turn in and unite the opposite folds with a running catgut suture. Two-thirds of the broad ligament may be safely removed in this way. This, to my mind, is preferable to the plan, once more common than now, of stitching the peritoneal sac in the lower angle of the wound and draining it as in an ordinary incomplete operation. Of course, if the surgeon cannot enucleate the sac, it must be treated in this way, which is safe enough, though the subsequent process of granulation may be long and tedious. The writer cannot insist too strongly on the importance of the reader's recognizing clearly the relations of a parovarian cyst before he attempts its removal.

On the one hand, it may be the easiest operation in abdominal surgery, with a mortality which is practically *nil*, while, on the other, it may be one of the most difficult. In either case the mortality may be sufficiently low in the hands of an experienced operator to justify the rule that parovarian cysts the size of a fœtal head at term should be extirpated, but for the occasional operator the rule should be rather as follows: Make an explorative incision, puncture, and remove the cyst if a pedicle can be found ; otherwise let it alone, or you may get into a dilemma from which it will be difficult to extricate yourself with credit, and, above all, with safety to the patient.

SIMPLE CYSTS OF THE BROAD LIGAMENT.

Various other cysts, of minor importance, may develop in the broad ligament, such as the hydatid of Morgagni, a little pear-shaped body springing from one of the lower fimbriæ of the Fallopian tube. This is to be distinguished from the sessile cysts which often grow behind the ovarian fimbriæ. Cysts may develop at the outer extremity of the horizontal tube of the parovarium ; these are also pedunculated, and are lined with a layer of non-ciliated epithelium. They may spring from the vertical tubes of the parovarium and also from the interior layer of the broad ligament. A sort of local dropsy of the broad ligament, due to congestion or œdema, is often seen in connection with uterine fibroids.

These little bodies have been distinguished as simple cysts of the broad ligament, and are to be clearly distinguished from parovarian cysts, already described ; in fact, the unchanged parovarium may be found on their outer surface. They are unilocular, are lined with endothelium, and are covered by the two layers of the broad ligament until they come in contact with the ovarian fimbriæ of the tube ; then, if they become larger, they may often present an appearance identical with that of parovarian cysts. They possess no particular clinical importance, and are the variety most likely to be cured after tapping or rupture.

SOLID TUMORS.

There are probably many fibromata which are supposed to originate in the broad ligament, but which are really subperitoneal uterine fibroids that have developed between its folds. True myomata may grow in this region at points where unstriped muscular tissue is normally found,— namely, in the round ligament, in the ovarian ligament, and in the connective tissue between the folds of the broad ligament. They are usually of small size, but Doran describes a specimen weighing sixteen pounds. Clinically, it would be practically impossible to distinguish these from uterine fibroids. If pedunculated, they may be easily removed ; but if, as sometimes happens, they are situated between the folds of the ligament, it is necessary to enucleate them in the same manner as intra-ligamentous cysts.

Lipomata have been occasionally observed in this locality ; sarcomata

and carcinomata are secondary to disease in the uterus or ovaries. Warty growths found in the folds of the broad ligament are usually secondary

FIG. 47.
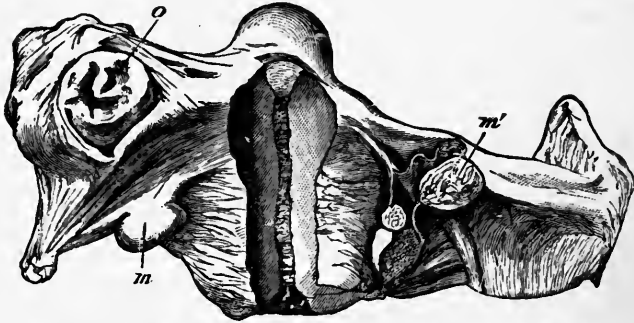
Myomata of broad ligament (*m, m'*).—*o*, small ovarian cyst. (Winckel.)

to papilloma developing in the parovarium, or in a parovarian cyst. Such a neoplasm may originate in the Wolffian remains within the folds of the ligament and involve the ovaries subsequently. Only careful examination of the specimen would reveal its true origin.

FIG. 48.

Fibroma of the ovarian ligament. (Doran.)

Echinococcus cysts, though extremely rare in this country, may develop within the pelvis in the subperitoneal connective tissue, whence they may grow upward between the folds of the broad ligaments, and, lifting up the peritoneum, extend into the iliac fossa. They are round, elastic, and not connected with the uterus or the ovaries, and on explorative puncture the characteristic hooklets are found in the fluid.

PAROVARIAN VARICOCELE.

Winckel has called particular attention to this condition, which was originally described by Richet. The latter recognized two varieties, one lying between the tube and the ovary and the other beneath the ovary. True varicocele is to be distinguished from simple varicose dilatation of the veins of the pampiniform plexus, such as is frequently found in connection with neoplasms both of the uterus and of the ovaries. In the former there is permanent dilatation of the vessels, the walls of which are thickened, and the veins themselves often contain thrombi or phleboliths. It is doubtful if a close comparison can be drawn between varicocele in the

male and in the female, since venous congestion is so much more common in the latter under physiological conditions, the anastomosis between the vessels being so free that extreme hyperæmia and dilatation are possible without leading to actual changes in the structure of their walls.   The attempt has been made to endue this condition with considerable clinical and surgical importance, on the ground that it may lead to serious secondary

Fig. 49.
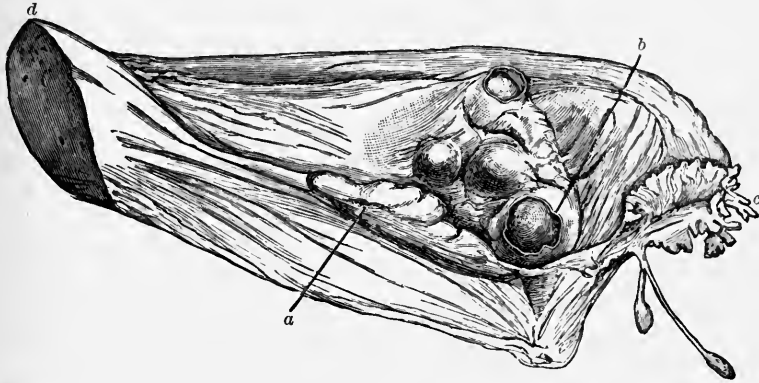
Parovarian varicocele with thrombosis.—*a*, right ovary; *b*, enlarged veins containing thrombi; *c*, fimbriated end of tube; *d*, right horn of uterus.   (Winckel.)

changes in the ovary.   The symptom described in connection with varicocele, which has been frequently noted as a complication of retro-displacement of the uterus, is dull, aching pain extending upward to the region of the kidney, disappearing after the patient has occupied the recumbent position for some time, and reappearing as she stands erect, as in the male. Winckel calls attention to the fact that these dilated veins may rupture, leading to retro-uterine hæmatocele; but no cases have been reported in which this accident has been verified at autopsy.   It has been asserted that the diagnosis of this condition could be made bimanually, one finger being in the rectum.   Under favorable circumstances, a peculiar knotted condition of the vessels is felt at the upper portion of the broad ligament. This would be more apparent if the veins contained phleboliths.   The alternate filling and emptying of the vessels according to the change of posture might give some clue to the true condition, but it would be extremely difficult to distinguish the enlarged and thickened veins from ordinary indurations in the broad ligament due to former perisalpingitis and ovaritis.   There is usually accompanying disease of the uterus or of the adnexa sufficient to give rise to the symptoms.

While the writer does not deny the existence of the condition, he is disposed to regard it as of secondary importance, and is still sceptical as to the possibility of clearly detecting it at the examining-table.[1]

---

[1] See American Journal of Obstetrics, vol. xxii. p. 504.

The operative treatment of this condition is practically associated with that of the coexisting affection in the uterus or adnexa. For example, in supra-vaginal amputation and complete extirpation of the fibroid uterus the broad ligaments are so thoroughly ligated as to remove the affected veins. In removing the adnexa, if the veins cannot be entirely included within the ligature, additional ligatures may be passed through the broad ligament at a lower point, so as to enable the operator to excise the varicocele. Kelly has practised an ingenious procedure of ligating the veins *in situ,* but this is not calculated to be of permanent benefit, because of the free intercommunication of the vessels within the broad ligament.

TUMORS OF THE ROUND LIGAMENT.

Physiological enlargement of these ligaments during pregnancy is well known. It may become extreme, so that they may be readily seen and felt through the abdominal wall to be as large as the forefinger. The enlargements found in this region are cysts, fibro-myomata, and fibro-sarcomata.

Cyst or Hydrocele.—This is supposed to be developed within the canal which represents the original round ligament. It is at first hollow instead of solid. It may appear in the form of several cysts, or of a collection of fluid either within the inguinal canal or at the external ring. Schroeder reports a case in which there seemed to be a communication between the cyst and the peritoneal cavity, since the fluid could be reduced within the abdomen.

Fibroma and Fibro-Myoma.—These are the most common, especially fibro-myoma. Myxo-fibroma and fibro-sarcoma have also been described. They are rarely situated within the intra-peritoneal portion of the ligament, though they are most often found within the inguinal canal or at the external ring; also at the insertion of the ligament. They usually begin at the external ring and grow downward towards the labia. They are found most often upon the right side, being rarely bilateral. In some cases pregnancy has seemed to be an exciting factor, though they have been thought to result from trauma.

The differential diagnosis from hernia, either inguinal or ovarian, is made from their hardness, their slow growth, the absence of pain, especially during menstruation, and the absence of dysmenorrhœa. They are distinguished from the inguinal glands by their hardness and by the fact that, when small, they may be often reduced within the canal. A pedunculated tumor in this region may grow from the round ligament or may be a fatty hernia. The latter is soft, painful, and ill defined. Hernia of the ovary has an oval shape, is very tender, and increases in size during menstruation. If the tumor develop towards the labium, it may be mistaken for a cyst of Bartholin's glands. In this case the history of its original location and its insertion at the external ring will show its origin from the round ligament. Of course, if the tumor is intra-peritoneal, it will be almost impossible to distinguish it from a subperitoneal uterine fibroid or

a solid ovarian tumor.   Abscesses are to be distinguished by their history and location ; malignant disease by the absence of pain and by the rapid depreciation of the general health.   It may be impossible to distinguish a neoplasm of the round ligament from sarcoma growing from the adjacent muscles or pelvic bones.   Malignant degeneration is to be feared because of the location of the tumor and its rich blood-supply from the epigastric artery.   In a doubtful case an explorative incision furnishes a positive means of diagnosis.   The only treatment is extirpation, which is easy when the tumor develops from the external ring.   When situated within the internal ring and projecting into the peritoneal cavity, its removal involves the performance of cœliotomy, which may be a difficult and bloody operation.

CHAPTER XIV.

ECTOPIC PREGNANCY.

BY WILLIAM T. LUSK, M.D.

AFTER coitus the spermatozoa may make their way through the Fallopian tubes to the pelvic cavity.[1] It is therefore possible for the ovum to be fecundated in any portion of the route from the ovary to the uterus. In exceptional cases the ovum may, after fecundation, be arrested in its travels and develop at a point external to the uterine cavity. To these cases the term ectopic pregnancy is now applied.

Until the publication of Mr. Tait's " Lectures on Ectopic Pregnancy," in 1888, it was the common belief that the ovum might, after fecundation, develop primarily in the tube, within a Graafian follicle, or in the peritoneal cavity ; but in the work referred to, Mr. Tait expressed the belief, based upon the examination of a large number of specimens, that all cases of ectopic pregnancy are *ab initio* of tubal origin. The possibility of a primary abdominal pregnancy he denied. The ovarian form he regarded as possible, but not proved. Subsequent research has tended to sustain Mr. Tait's position. In any event, the ovarian and abdominal forms are extremely rare. Nearly all the cases once quoted in support of their primary occurrence have been found to lack the requirements of serious scientific evidence, and even the few which cannot be summarily laid aside are not free from critical objection.

Tubal pregnancies, once regarded as rare events, and usually discovered only at post-mortem examinations, are now known to be frequent mishaps, and the possible cause of a large number of ordinary pelvic disturbances.

Tubal Pregnancy.—The ovum may find lodgement in any part of the tube. The cause is most frequently to be found in the various forms of chronic salpingitis. Owing to the associated loss of epithelium, to dilatation, and to other changes in the tubal wall, the two active forces which propel the ovum through the tube—ciliary movements and peristalsis—are

---

[1] Mr. Tait has long advocated the doctrine that, under normal conditions, the ovum first encounters the spermatozoa after its entrance into the uterine cavity. This view has been maintained still more recently by Wyder and Martin. *Vide* discussion on Martin's paper, Aetiologie der ektopischen Schwangerschaft, Zeitschr. f. Geb. und Gyn., Bd. xxvii. S. 205 *et seq.*

weakened and destroyed, while unimpeded ingress is afforded to the spermatozoa.

Again, the passage of the ovum may be interfered with by the secondary results of catarrhal inflammation, such as mucous polypi and sac-like dilatations, or constrictions, flexions, and dislocations of the tube, due to adhesions and bands, the products of associated peritoneal inflammations.

Abel,[1] in a case in which tubal pregnancy occurred a second time in the same patient, found a spiral rotation of the tube on the uterine side, a condition which had previously been shown by Freund to be a sign of arrested development. He ascribes the presence of diverticula to a similar origin. He suggests that these spiral turns and diverticula resulting from an infantile state of the tube are accountable in many instances for recurrent ectopic gestation where adhesions, polypi, and catarrhal inflammations can be excluded as etiological factors.

Because of its frequent connection with inflammatory processes, the occurrence of tubal pregnancy is often preceded by a long period of sterility. When due to constriction, the closure of the tube may be only partial, permitting the spermatozoa to reach the ovum, while the latter, owing to increase in size attendant upon fecundation, finds its onward progress arrested; when complete, on the contrary, the spermatozoa can gain access to the ovum only by first passing through the patulous tube, and then migrating across the rear of the uterus to the ovary, or to the open abdominal end of the tube upon the opposite side. In a considerable number of cases the corpus luteum has been found upon the side opposite the tube containing the fecundated ovum. With the present prevailing views[2] this phenomenon is to be accounted for only by the hypothesis of the migration of the ovum across the peritoneal surface of the pelvis, or across the uterine cavity from one tube to the other. That the external migration of the ovum is possible has been shown experimentally by Leopold,[3] who found that, after tying the right tube and removing the entire left ovary in a couple of rabbits, uterine pregnancy took place. The doctrine of the internal migration of the ovum is more a matter of dispute. The normal mechanism by which the ovum is conveyed into the uterus is presumably peristalsis of the tubes and the current produced by the lining ciliated epithelium,—both forces which would naturally offer resistance to the passage of the ovum from the uterine cavity into a tubal canal.[4]

---

[1] Abel, Wiederholte Tuben-Gravidität bei derselben Frau, Arch. f. Gyn., Bd. xliv. S. 72.

[2] Mayshofer, Ueber die gelben Körper und die Ueberwanderung der Eies, denies the whole doctrine of a distinct corpus luteum of pregnancy, and holds that corpora lutea are found at stated intervals—perhaps monthly—through the entire period of pregnancy.

[3] Leopold, Die Ueberwanderung der Eier, Arch. f. Gynaek., Bd. xvi. S. 24.

[4] Wyder (Beiträge zur extrauterin Schwangerschaft, Arch. f. Gynack., Bd. xli. S. 188 et seq.) believes that a specimen examined by him furnished the anatomical evidence of the occurrence of the phenomenon in question. He argues that it is rendered possible by the loss of the ciliated epithelium and by pressure exerted directly upon the ovum by the

Of late a number of observations have been placed on record showing that a recurrence of ectopic pregnancy in the same patient occasionally takes place. Abel, whose paper has already been referred to, furnishes ten cases reported as belonging in this category, eight of which he regards as indisputable. More recently, Dr. Henry C. Coe[1] has published a novel instance in which pregnancy occurred a second time in the same tube. (Fig. 1.)

FIG. 1.
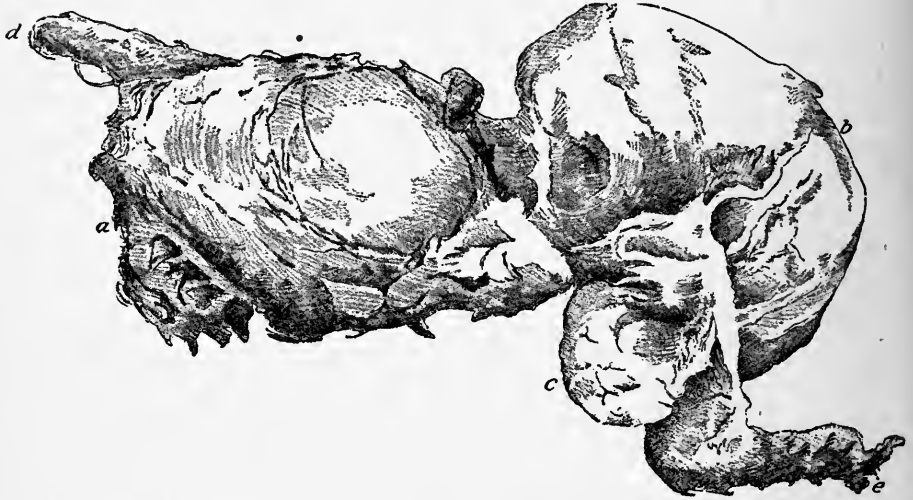
Repeated pregnancy in the same tube.—*a*, old sac; *b*, recent sac; *c*, atrophied ovary; *d*, divided proximal end of right tube; *e*, fimbriated extremity of tube. (Coe.)

Tubal pregnancy is associated with the formation of a uterine decidua which differs in no wise from that of pregnancy, except that the distinction into three layers is less marked.

A complete decidua within the tubal sac enclosing the ovum is, at least during the early stages of growth, exceptional. Thus, Zedel[2] found the cells

---

uterus, a pressure resulting from antiperistaltic movements supposed to occur during coitus, or from uterine contractions at the menstrual period. D. Veit (Die Frage der inneren Ueberwanderung der Eier, Zeitschr. f. Geb. und Gyn., Bd. xxiv. S. 327) discredits the anatomical value of Wyder's specimen.

[1] Coe, Internal Migration of the Ovum, etc., Am. Jour. Obstetrics, June, 1893, p. 855. Hayden's case, referred to in Coe's report, is regarded by Abel as pregnancy in the rudimentary cornu of a uterus bicornis. The list of recurrent ectopic pregnancies includes the cases of Schwarz, Tait, Winckel, I. Veit, Hermann, Leopold, Meyer, Olshausen, and Frommel. The case of Henkelom of Leyden, and a second case of Hermann, are reported as doubtful.

[2] Zedel, Zeitschr. f. Geb. und Gyn., Bd. xxvi. S. 78. It should be mentioned that the opinions regarding the anatomical changes which take place during the development of the ovum in ectopic pregnancies have undergone considerable modification during the past few years. Those given are derived especially from the recent studies of Abel, Klein (Zur Anatomie der schwangeren Tube, Zeitschr. f Geb. und Gyn., Bd. xx. S. 288), and Zedel. The net outcome would seem to indicate an ever-diminishing difference between the conditions existing in normal and those existing in ectopic gestations.

of the mucous lining for the most part flattened and atrophied by pressure, while the decidual changes were limited to the vicinity of the insertion of the ovum.

In the decidua serotina the cells have the same shape and character as those of the uterine mucous membrane. They consist chiefly of large spindle-shaped and polyhedral cells with vesicular nuclei, between which are scattered round cells like leucocytes and narrow cells of connective tissue. Giant cells are found here and there, especially in the median layer. Next to the muscular coat there is a transitional zone in which decidual cells are intermingled with muscular and connective-tissue fibres. The inner surface is covered with the so-called canaliculated fibrin, due, according to Zedel, to an increase of the intercellular substance with separation of the cells, loss of cell-contours, and disappearance of the nuclei. A homogeneous mass is thus produced with occasional striæ, to which the name is due.

Concerning the decidua reflexa opinions are conflicting. Frommel, Winckel, Werth, Veit, Orthmann, and Zedel maintain its existence. None was discovered by Langhans, Leopold, and Klein. Zedel thinks Klein's failure to find the reflexa was due to his not examining an intact ovum.

The placental circulation does not differ from that of ordinary pregnancy. The veins traverse the walls of the tube in an oblique direction. No important changes occur before they penetrate the decidua ; they then widen (eight to ten times) and are speedily lost in the serotina. The arteries, after reaching the decidua, make increased spiral turns, and pass obliquely to the decidual elevations, where the muscular walls are gradually lost, and the vessels consist of endothelium and the connective tissue of the adventitia only. Zedel believes that it is the pressure of the blood-stream, and not the growth of the villi, which opens up the thinned walls of the vessels and leads to the formation of the intervillous communications.

The development of the chorion is like that in uterine· gestation. The lumen of the tube, both at the central and at the distal extremity of the ovum, remains normally patent.

In the early months the development of the ovum leads to a spindle-shaped dilatation of the tube, associated with hypertrophy of the muscular walls, due to increase in the length and thickness of the individual fibres. As regards the degree of hypertrophy, very great individual variations have been observed. Indeed, in the same sac a thickening at one point may be accompanied by an excessive degree of tenuity, due to eccentric growth of the ovum, at another. Now, the ultimate fate of a tubal pregnancy is in large measure dependent upon these anatomical differences. Unquestionably, early rupture is the rule. Mr. Tait says, "Out of an enormous number of specimens which I have examined, I have entirely failed to satisfy myself that rupture has been delayed later than the twelfth week." It seems to me, however, carrying scepticism too far to refuse credence to the positive observations of others, made apparently with the utmost care and with full knowledge of possible sources of error, which seem to show that

a tubal pregnancy may exceptionally reach an advanced stage or even full term. At present it seems fair to assume that when the sac which surrounds the ovum is composed of muscular and connective-tissue fibres with an external peritoneal envelope, and directly communicates with the Fallopian tube, the sac-walls are of tubal origin. Of course it is not possible to assert that no rupture has taken place in the course of development. It is only known positively that rupture occurring at the site of placental attachment gives rise to hemorrhage fatal to the fœtus ; and the same is true, with rare exceptions, when rupture occurs at any point of the peritoneal surface. That rupture into the cavity of the broad ligament has first occurred in all the cases which go on to the period of viability does not seem so absolutely certain. The anatomical appearances, in some instances at least, indicate that the exposure of the fœtal membranes here and there through the maternal sac results not so much from laceration as from the gradual separation of the muscular fibres due to excessive stretching.[1] In most of the cases in which the pregnancy reaches an advanced stage the development of the tube takes place principally between the folds of the broad ligament. The support furnished the tubal sac by the gradual unfolding of the layers of the ligament hinders rupture. More rarely pregnancy may reach the period of viability without encroaching upon the intra-ligamentous space. The tumor then rises above the pelvic brim, and is furnished with a sort of pedicle consisting of the uterine end of the tube and of the broad ligament.

The first, or intra-ligamentous, form lies close to the uterus, which it not infrequently crowds upward and forward. The uterine end of the tube varies greatly in length. The fimbriated extremity is unrecognizable. Usually no traces of the ovary are found. In the so-called pedunculated form the uterus is crowded to one side or is retroverted. The uterine end of the tube is usually long and thickened. The corresponding ovary has generally been discovered. In both cases the relations of the sac are often obscured by adhesions to adjacent viscera. In the second half of pregnancy rupture of the sac and the escape of the fœtus into the peritoneal cavity may occur without noticeable hemorrhage, or without interruption of pregnancy. As the pressure is removed by the escape of the amniotic fluid, the placental borders curl inward so as to furnish a cup-like space, while the membranes sink downward and cover the upper placental surface. The fœtus in these cases may occupy the abdominal cavity, or a sac may be formed by the agglutination of the adjacent viscera.

Werth was the first to report a case in which the death of the embryo, occurring in the second month, was followed by hemorrhage, which poured through the abdominal end of the tube into the pelvic cavity and gave rise to intra-peritoneal hæmatocele. This form he termed tubal abortion. In a

---

[1] *Vide* tables of Werth, Beiträge zur Anatomie und zur operativen Behandlung der Extrauterinschwangerschaft.

case described by Wyder the fimbriated extremity of the tube was obliterated, and, as a consequence, the hemorrhage following the separation of the ovum converted the ampulla of the tube into a blood-cyst the size of the fist. Many similar observations have since been made by others.

Pregnancy in the Rudimentary Cornu of a One-Horned Uterus.—This anomaly so closely resembles the tubal form of pregnancy that the diagnostic distinction can rarely be established during life. When the muscular structures of the cornu are sufficiently developed the pregnancy may advance to term.[1] Indeed, cases have been reported by Grinew, Schultze, Litschkus, and Handfield, where labor-pains at the end of gestation were followed by the expulsion of the child; but, according to the estimates of Stoll,[2] based on statistics gathered by himself, by Sänger, and by Himmelfarb, eighty per cent. terminate in rupture. To this a special predisposition is created by the obliteration, after conception, of the lower portion of the rudimentary cornu, which thus becomes an impervious cord. Stoll therefore advises, in cases where the diagnosis has been made at an early period, to pass the finger into the cervix to ascertain whether a communication with the pregnant cornu exists. Should such be the case, abortion would be indicated; whereas if the cornu was impervious the proper procedure would be cœliotomy and amputation.

Interstitial Pregnancy.—The term "interstitial pregnancy" is applied to cases in which the ovum is developed in the uterine portion of the tube. The latter measures about seven lines in length by one line in diameter. At first the muscular walls hypertrophy and form around the ovum a sac which projects from the upper angle of the uterus. Since, ordinarily, the growth of the muscular tissue does not keep pace with that of the ovum, rupture occurs at an early period. In twenty-six such cases collected by Hecker, all ruptured before the sixth month. Tait says that, "so far as known, interstitial pregnancy is uniformly fatal by primary intra-peritoneal rupture before the fifth month." Schwarz,[3] however, reports a case belonging to this category in which the fœtus was expelled into the uterine cavity.

The patient was known to be pregnant. Repeated hemorrhages indicated a threatened abortion. To avoid further dangers, the cervix was dilated with the view of emptying the uterus. On examination with the finger the uterine cavity was found to be empty, but there was a piece of membrane at the uterine opening of the left tube, which was removed.

---

[1] Turner, Edinburgh Medical Journal, May, 1886, p. 974; Werth, Arch. f. Gynaek., Bd. xvi. S. 281; Salin, Centralblatt f. Gynaek., 1881, S. 221.

[2] Stoll. Beitrag zur Gravidität des Uterus bicornis, Zeitschr. f. Geb. und Gynaek., Bd. xxiv. S. 275.

[3] Schwarz, Wiener Med. Blätter, 1886. In the abstract furnished by Grandin in the American Journal of Obstetrics (January, 1887, p. 101) the date of pregnancy is not given. Similar cases have been reported by Dr. Charles McBurney (New York Med. Jour., March, 1878, p. 273) and by Dr. Cornelius Williams (Ibid., December, 1878, p. 595), both of which were followed by the recovery of the mother.

The next day the finger detected membrane at the same site, and, beyond, a
hard body. The uterus began to contract energetically. On the fifth day
a fœtus was passed by the vagina, the pains ceased, the tumor became much
smaller, and the patient made a good convalescence.

FIG. 4.
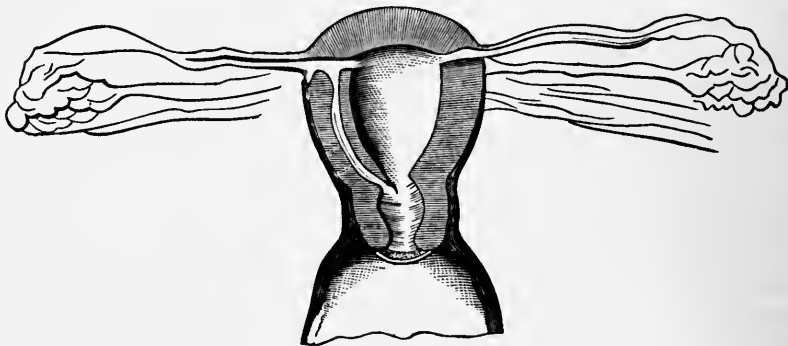
Bifurcation of tubal canal.   (Hennig.)

Martin removed a male fœtus thirty-three centimetres long (six months)
from the left uterine cornu. The patient recovered. Duvelius, who exam-
ined the specimen, concluded that the ovum had partly grown into the tube
and between the folds of the broad ligament. He thought that rupture had
been prevented by the number of the muscular elements in the sac-wall.[1]

A possible form of interstitial pregnancy is furnished by the occasional
existence of a canal, open at its two extremities, and apparently a continua-
tion or a bifurcation of the Fallopian tube. A case reported by Dr. Gilbert
in the *Boston Medical and Surgical Journal* (March 3, 1877), in which
the head of the child could be felt just above the os internum, covered
by a thin mucous membrane, and in which delivery was successfully ac-
complished by an incision through the partition, probably belonged to
this variety. A similar case, in the practice of Dr. H. Lenox Hodge, is
reported by Parry.

In the post-mortem examinations the distinction between an interstitial
pregnancy and one in a rudimentary cornu is not easy to make out. The
chief point of difference consists in the fact that in interstitial pregnancy
the sac communicates by an orifice with the uterine cavity, or is separated
from the uterus by a partition, while in pregnancy in a rudimentary cornu
the two halves of the uterus are united by a muscular band, which is situ-
ated not at the upper angle, but near the os internum.

Ovarian Pregnancy.—In spite of modern scepticism, there is little
question as to the occasional occurrence of ovarian pregnancy. The speci-
men discovered by Patenko [2] in the Pathologico-Anatomical Museum of St.

---

[1] Martin, Zeitschr. f. Geb. und Gynaek., Bd. xi. S 416.
[2] Patenko, Casuistische Mitteilungen, Arch. f. Gynaek., Bd. xiv. S. 156.

Petersburg seems to answer all the requirements of a demonstration. The right ovary was of the size of a hen's egg, and contained a cyst with smooth walls filled with serum. In this he found a body of a yellow color, of the size of a hazel-nut, which contained cylindrical and flat bones. The most careful microscopical examination established the fact that the bones were those of a fœtus, and not merely the chance products of a dermoid cyst. The presence of corpora lutea and follicles in the walls of the envelope proved that the body was an ovary. The tube on the corresponding side was nowhere adherent to the sac. The abdominal extremity was closed, and there were no traces of fimbriæ.[1]

Paltauf[2] relates a case of extra-uterine pregnancy in which there was a sacculated condition of both tubes which communicated with a cyst of ovarian origin. The ovaries were closely united. By means of the ovarian cyst a complete communication was established between the two tubes. In the large central ovarian cyst a clot was found which contained an embryo corresponding in size to one of from forty-five to forty-eight days' development. The origin of the condition here met with is naturally a matter of speculation.

Abdominal Pregnancy.—In most cases of abdominal pregnancy a connective-tissue proliferation is set up about the ovum, which surrounds it with a vascular sac. The latter often attains a degree of thickness which renders it comparable to the gravid uterus. (Klob.) The walls keep pace, as a rule, with the growth of the ovum, and, as they extend into the abdominal cavity, form adhesions to the intestines, the mesentery, and the omentum. It is stated that organic muscular fibres have been found in the sac, especially near the uterine attachment. In this form the fœtus most frequently reaches maturity.

In rare cases the ovum develops free in the abdominal cavity, without the formation of pseudo-membranes, the fœtus being surrounded solely by the amnion and chorion.

The greater number of so-called abdominal pregnancies are unquestionably of tubal origin. In reality, they are for the most part extra-peritoneal, and result from a rupture in the tube-walls occurring between the folds of the broad ligament. In these cases the conditions are not incompatible with continued fœtal development, and gestation may reach an advanced stage.

The question as to the occurrence of primary abdominal pregnancy must be regarded as unsettled. The discovery of an ovum growing in the peritoneal cavity, with the tubes and ovaries demonstrably intact, would

---

[1] Mr. Tait, in his work on Ectopic Pregnancy, refers to a specimen described by Dr. Walter as one of primary ovarian pregnancy (the sac had ruptured at the fifth month and the fœtus had escaped into the peritoneal cavity), which is now in the Dorpat Museum, and suggests a careful investigation as to its real character. At Werth's request, this has since been made by Runge, with a complete confirmation of the significance given to it by Walter in his original publication. Werth, *loc. cit.*, p. 64.

[2] Paltauf, Arch. f. Gynaek., Bd. xxx. S. 456.

suffice to establish the abdominal variety. In the early months, before the anatomical conditions are obscured by secondary changes, there is no pretence that such proof has been obtained. In more advanced stages a good

Fig. 5.
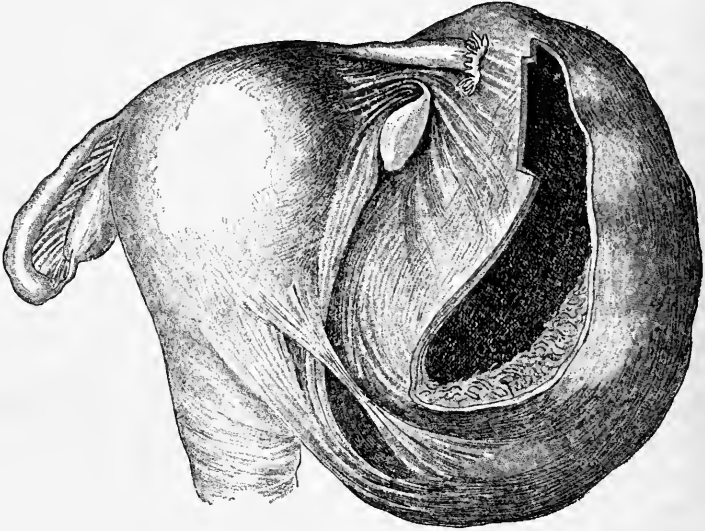
Case of supposed abdominal pregnancy. At first it was reported as such by Zweifel, but later, after careful microscopic examination, it proved to have been primarily tubal.

many cases of assumed abdominal pregnancy have been placed in evidence. These, so far as my investigations permit me to judge, are divisible into two classes :

1. Cases in which the tubes are reported as intact, but in which there exists a direct communication between the tube upon the affected side and the sac-cavity.

2. Cases in which the tubes are reported as intact and not in communication with the sac.

Few of these merit criticism. In many, without doubt, the ovum was primarily implanted in the fimbriated extremity of the tube, from which later it grew either outward into the abdominal cavity or downward between the folds of the broad ligament.

In certain cases rupture of the sac and the fœtal membranes may occur, and the fœtus pass into the abdominal cavity ; these are termed secondary abdominal pregnancies. Most often the child dies at or soon after rupture, but instances have been reported in which it continued to develop within the abdomen. The presence of the child usually excites an active proliferation of connective tissue, by means of which a secondary sac is formed, though in Jessup's case the child was absolutely free in the abdominal cavity, and in one of my own, eleven years after rupture, the child was found attached to the omentum, but without any special investment.

A few histories are on record of the coexistence of extra uterine and intra-uterine pregnancies; the latter occur at the same period as the former, or subsequent to the death of the extra-uterine fœtus.

Tubo-Abdominal and Tubo-Ovarian Pregnancy.—When the ovum becomes lodged near the trumpet-shaped extremity of the Fallopian tube it may grow outward into the abdominal cavity. Local peritonitis is then set up, and plastic exudation is thrown out, forming an envelope around the ovum, which is likewise bounded by the contiguous organs. In this way the ligamenta lata, the ovaries, the mesentery, the intestines, the bladder, and the uterus may all contribute to the investment of the fœtal membranes. In case of rupture in the tubal portion, inflammatory products may form and limit the extent of the injury. At first, owing to its weight, the distended tube drops into the cul-de-sac of Douglas. In advanced pregnancy, the spleen, kidneys, and liver may become involved and form part of the sac-walls around the ovum. Usually the placenta is developed in the pelvic cavity.

When the investment of the ovum is furnished by the tube and the ovary the term tubo-ovarian pregnancy is employed. The course in either case does not differ materially from that of an abdominal pregnancy.

Symptoms.—The earlier symptoms of extra-uterine pregnancy do not materially differ from those of the intra-uterine form. Menstruation usually ceases, though not with the same regularity as in normal pregnancy. The recurrence of the monthly flow for one or two periods is not an uncommon incident. In some cases, too, a nearly continuous sero-sanguinolent discharge of moderate extent has been observed. Up to a certain point the hypertrophic changes of the uterus take place in the usual manner. The mucous membrane is converted into a decidua, and a mucous plug fills the cervix. In general terms, the length of the uterus is greater the closer the contiguity of the ovum to the uterus. In a few cases of tubal pregnancy there has been no increase in the size of the uterus. The extra-uterine ovum may, in the course of its growth, drag the uterus upward, or push it downward, forward, or to the side, according to the site of its development.

Characteristic symptoms of extra-uterine pregnancy do not occur until the ovum has reached a certain degree of growth, and in some cases not until after rupture has taken place. Often preceding rupture, or, in abdominal pregnancies, before the death of the fœtus, the patient suffers from paroxysmal pains in the sac and uterine pains like those of labor. The latter are associated with a sero-sanguinolent discharge, and are followed by the expulsion of portions of the decidua.

The symptoms of rupture are the usual ones of internal hemorrhage,— viz., yawning, languor, fainting, clammy perspiration, rapid pulse, intermittent vomiting, collapse, and acute anæmia. After the death of the ovum these symptoms may cease and not return again; whereas if the ovum continues to grow there may be repeated attacks of hemorrhage and local peritonitis.

When the death of the ovum does not occur within the first three or four months, the pressure of the tumor usually gives rise to dysuria and constipation.

Terminations.—The investigations resulting from the recent widespread interest in diseases of the uterine appendages have shown that tubal pregnancy is by no means of rare occurrence. Whereas in tubal and interstitial pregnancies it was formerly believed that the usual terminations were rupture of the sac, hemorrhage, peritonitis, and death, it is now known that in a pretty large percentage of cases the ovum perishes at an early period of development, and, though the sequelæ of these so-called tubal abortions may cause discomfort or lay the foundation of chronic invalidism, they do not necessarily lead to a fatal result. As in cases of uterine abortion, the death of the ovum is for the most part followed by hemorrhage, which may be confined to the tube (hæmatosalpinx), or the blood may escape by the fimbriated extremity into the peritoneal cavity, or, if circumscribed by adhesions, it may give rise to the intra-peritoneal form of pelvic hæmatocele. Even when rupture takes place the hemorrhage is not necessarily fatal. Mr. Tait insists on the relative harmlessness of most cases of hæmatoma due to rupture occurring between the folds of the broad ligament; while the records of cœliotomy show that, even with intra-peritoneal rupture, the hemorrhage has often been found moderate in amount, and did not in itself furnish the occasion for surgical interference.[1]

In abdominal pregnancies, which it has been seen are usually, if not always, secondary to the tubal form, the ovum or fœtus, as a rule, excites a local peritonitis, attended with pain and fever, and followed by the formation of pseudo-membranes, which exercise a conservative influence by shutting off the ovum from the peritoneal cavity. Indeed, in the exceptional instances in which these inflammatory conditions do not develop, the movements of the fœtus within its own membranes may give rise to such intense suffering as to cause the woman to die from exhaustion. (Schroeder.)

In abortions at an early stage it often happens that no trace of the embryo is found, and the diagnosis must be made from the presence of the chorionic villi. Even when abortion does not occur in the first few weeks the child is apt to die prematurely. Sometimes, however, gestation may advance to full term; in this case labor-pains set in, the decidua is expelled, and the child dies during the expulsive efforts. In the majority of cases the dead fœtus excites a suppurative inflammation in the sac by which it is enclosed, and the patient dies either from general peritonitis or from profuse suppuration. In cases in which the peritonitis remains local and the suppuration is tolerated, fistulous communications may form with one of the hollow viscera or the abdominal walls, through which the contents of the sac may be eliminated. Most frequently the opening takes place into the large intestine, quite often through the abdominal walls, more rarely

---

[1] For example, the cases reported by Orthmann from Martin's clinic.

Fig. 2.
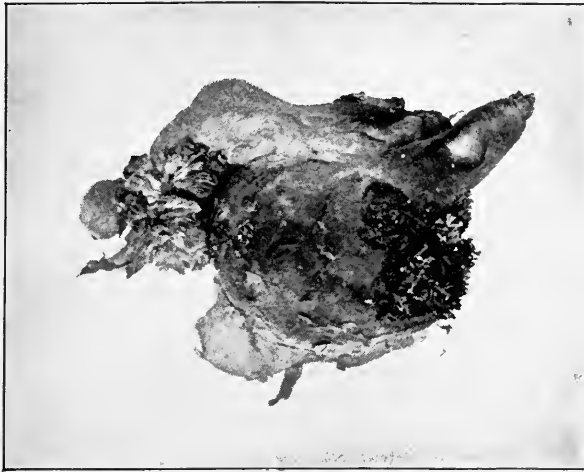
Tubal pregnancy.—Development of ovum between folds of broad ligament; secondary rupture into peritoneal cavity.

Fig. 3.

Rupture of tube.—Ovum surrounded by coagulated blood between folds of broad ligament

into the vagina and bladder. In any case, the process of elimination is slow, often lasting months and even years. When the bones and the soft tissues have all been discharged, complete recovery may take place. In the larger proportion of cases, however, if nature is not assisted, the patient perishes from exhaustion and blood-poisoning before the process is ended.

Sometimes the foregoing inflammatory changes do not occur as the result of the death of the fœtus, in which case the fluid contents of the sac are re-absorbed and the walls collapse and come in contact with the fœtal cadaver. The skin of the latter, and at a later period the deep-seated soft tissues, undergo fatty degeneration, and form a greasy substance consisting of fat, lime salts, cholesterin-crystals, and blood-pigment. Afterwards the fluid portions are absorbed, and the fœtus may shrink up like a mummy, pre-serving its shape and organs to the minutest detail; or partial calcification of the fœtus and membranes may ensue. A fœtus thus altered is called a lithopædion. A lithopædion in the sense of a complete petrifaction does not exist.

Küchenmeister distinguishes three conditions to which the term is applicable:[1]

1. When, after absorption of the fluid, the membranes alone calcify and the fœtus undergoes mummification.

2. When, after absorption or escape of the fluid, the membranes calcify and calcification of the fœtus occurs at points where the membranes adhere to the fœtal surface.

3. When the fœtus escapes into the abdominal cavity and cretaceous matter is deposited in the smegma covering the fœtal surface. In this way calcified strata form around the fœtus and exert compression upon the contained tissues. Beneath the chalky layers the tissues are mummified.

A lithopædion may remain embedded in connective tissue for years without injury to the mother. In a case reported by me the child was found attached to the omentum eleven years after the rupture of the tubal sac. The lithopædion of Leinzell was removed in 1720 from a woman ninety-four years of age, who had carried it for forty-six years. The pres-ence of the lithopædion does not prevent pregnancy from taking place. In some cases it may, after years, excite suppuration, a result which is fostered, according to Spiegelberg, by pregnancy and labor. Recovery may follow the artificial extraction of the foreign body, or death may result from inflammation and the discharge of pus.

Diagnosis.—The diagnosis of extra-uterine fœtation is based upon the existence of the signs of pregnancy, the exclusion of an ovum within the uterine cavity, and the presence of a tumor external to the uterus.

There is a wide difference of opinion as to the practicability of early diagnosis. The problem seems simple enough. Given pregnancy, and

---

[1] Ueber Lithopädien, Arch. f. Gynæk., Bd. xvii. S. 153.

having ascertained that the ovum is not in the uterus, the diagnosis is effected. But we all know that the subjective symptoms of pregnancy are deceptive, and that the pigmentation and the mammary and utero-vaginal changes are not always so clearly defined in the first three months as to make it safe in every case positively to diagnosticate pregnancy in even the intra-uterine form. The advice to use the sound to demonstrate the vacuity of the uterus in suspected cases has been the cause of many needless abortions. Fortunately, the sound often does no other harm than to add to our sources of error.

In the main, we must depend upon local changes and local symptoms. Thus, a tubal swelling and enlargement of the uterus, associated with suppression of the menses, often followed after a brief period by sero-sanguinolent discharges and increased flow at the menstrual period, with paroxysmal pains radiating from the side of the pelvis upon which the affected tube is situated, and with the expulsion of the uterine decidua at the end of the second or in the course of the third month, are to be regarded with suspicion. But a tubal sac is the product of a variety of pathological conditions.[1] The uterine changes in the early months are inconstant. These sometimes correspond to those of ordinary uterine gestation, but often there is neither perceptible enlargement nor cervical softening to indicate pregnancy. Paroxysmal pains are frequent in other forms of tubal disease, and menstrual disturbances are common phenomena in uterine derangements. The expulsion of the decidua, though a valuable sign, is not of constant occurrence. In many tubal abortions the only symptoms are those of pelvic hæmatocele. In many instances of early rupture of the tube with hemorrhage into the peritoneal cavity there are no antecedent symptoms, or only those of ordinary pregnancy. In reading the reported cases of the operative removal of pregnant tubes, it is surprising to note in how many of them the diagnosis was established only by the subsequent detection in the removed tubes of decidual cells and chorionic villi. Undoubtedly a probable diagnosis prior to rupture might be made in many instances if the patients could be subjected to frequent examinations from the beginning of the pregnant state, but this, in the nature of things, is rarely practicable.

In the intra-ligamentous form the conditions for diagnosis are more favorable. Here gestation is apt to be prolonged, and if rupture occurs between the folds of the broad ligament the hemorrhage is limited in amount. In this class the patients are apt to seek early professional advice, owing to the discomforts from which they suffer. The swelling at the side of the uterus is easily reached through the vagina, and we have as distinc-

---

[1] Veit regards as an important distinction in the early stage, that whereas in other forms of tubal enlargement the swelling may be hard, or tense, or fluctuating, when due to an intact ovum it possesses a characteristic soft feel. Verhandlungen der Deutschen Gesellsch. f. Gynaek., Third Congress, Leipsic, 1890, S. 162.

tive signs a rapidly growing tumor, early fluctuation, and the presence of pulsating vessels over the site of the tumor. Bimanual examination under an anæsthetic, especially if the thumb be introduced into the vagina and two fingers into the rectum, makes it possible to determine that the tumor is independent of the uterus.[1]

After the third month it is not ordinarily difficult to determine the existence of the pregnant state. Ballottement is usually perceptible at an early date, the fœtal movements are apt to be very painful, and the fœtal heart makes the diagnosis certain ; but the greatest care needs to be exercised in the examination of the patient and in the formation of an opinion concerning the extra-uterine situation of the ovum. In a suspected case, violence in the attempt to separate the tumor from the uterus may cause rupture of the sac. Mr. Tait cites as a misleading condition an abnormal thinness of the uterine walls. In my own experience, lateral flexion of the uterus often simulates ectopic gestation to a surprising degree. In these cases the fundus containing the ovum lies upon one side of the pelvis. The cervix is crowded to the opposite side. Between the two a deep sulcus is felt. If the patient is hysterical, these deranged relations are exaggerated by contraction of the abdominal muscles. No difficulty in detecting the error is experienced when the patient is anæsthetized, except in cases where the fundus is fixed to the side by adhesions. In two cases seen by me the intra-uterine nature of the pregnancy was determined only by the forcible introduction of the finger through the cervix. Cases of retroflexion of the gravid uterus, with incarceration, are likewise often difficult to distinguish from extra-uterine pregnancy.

The distinction by physical signs between the tubal, the ovarian, and the secondary abdominal form is scarcely practicable so long as trained anatomists fail to agree concerning them when the abdomen has been opened and the organs are exposed to view.

A review of the subject of diagnosis makes it apparent that many cases of ectopic pregnancy present no symptoms previous to rupture. In another class the existence of a suspicious tumor with few or none of the corroborative signs should lead to a waiting policy, or, when the symptoms are of a threatening character, to an explorative cœliotomy. It is well, however, to remember that, with reference to this latter procedure, recent popular interest in abdominal surgery has a tendency to invest trifling anomalies occurring in gestation with a sinister importance ; but there still remains a considerable class in which an early diagnosis can be reached with reasonable certainty.

---

[1] According to Smolsky's observations, the tube in the first two months is the size of a pigeon's egg ; at the end of the second month, of an English walnut ; at two and a half months, of a hen's egg ; at three months it reaches the size of the fist ; and at four months the size of two fists. Variations may result from hydramnios, hæmatosalpinx, malformation, etc. Smolsky, Diagnostie et traitement de la grossesse tubaire, Nouvelles archives d'obstétrique et de gynécologie, December, 1890, p. 649.

Treatment.—The treatment of extra-uterine fœtation varies in accordance with the stage of pregnancy and the condition of the fœtus. For the sake of convenience, we distinguish : 1. Cases of early gestation ; 2. Cases of advanced gestation (with a living fœtus) ; 3. Cases of gestation prolonged after the death of the fœtus.

1. *Cases of Early Gestation.*—The indication for treatment in the early months varies with the conditions. If rupture has occurred, care should be employed to ascertain, if possible, whether the resulting hemorrhage has taken place between the folds of the broad ligament, or, if intra-peritoneal, whether the blood is free in the abdominal cavity or is restricted to the pelvis by old adhesions. Circumscribed effusions of blood due to ruptured tubes do not, as a rule, threaten life, and disappear with time and with little other treatment than rest in the recumbent posture.

If the outpouring of blood has taken place primarily into the abdominal cavity, or as a secondary occurrence after the giving way of the first barriers, cœliotomy is unquestionably demanded. While it is not denied that even in these extreme cases the effused blood may be circumscribed by an adhesive inflammatory process, and that a few patients may recover under expectant treatment, the waiting policy is a gamble with life. On the other hand, the opening of the abdomen for the purpose of removing blood and clots and for the extirpation of the tube-sac has been the means, since Mr. Tait demonstrated the practicability of the operation, of saving multitudes of women from impending death. The operation is not, as a rule, difficult. It involves the separation of adhesions, where these exist, the tying of the pedicle, and the removal of the ruptured sac. In the intra-ligamentous form it may be necessary to ligate the attached portion in sections. Where a pedicle cannot be readily formed, Veit recommends the tying of the broad ligaments at the two extremities of the sac before proceeding to ligate the base. Previous to closing the abdominal incision great care should be taken to insure the arrest of hemorrhage not only from the stump, but from the separated adhesions.

When the diagnosis is made previous to rupture the choice lies between cœliotomy and the employment of measures to destroy the life of the embryo. In practice, the decision is pretty certain to be governed by other than theoretical considerations. Thus, an experienced operator, who possesses trained assistants and can command for his patient the surroundings which are needful for success, will be apt to select cœliotomy. The risks have been proved to be small, and the patient is relieved from possible future troubles due to retention of the products of conception. But all men are not experts in pelvic surgery. The danger which threatens the life of the patient is often imminent, and assistance from afar is not always easy to obtain. Under these conditions the question arises, how far reliance is to be placed upon measures designed to destroy the life of the fœtus, and thus, by arresting the growth of the ovum, to diminish the chances of immediate rupture and hemorrhage. Of the various methods heretofore

proposed to accomplish this object, only two merit discussion,—viz., the injection of morphine solution and the faradic and galvanic currents.

Injections into the Sac of Solutions designed to destroy the Fœtus.—This method was first suggested by Joulin.[1] He proposed injections of sulphate of atropine (one-fifth of a grain dissolved in a few drops of water) into the sac by means of a long hypodermic syringe. His suggestion was success-fully carried into effect in two cases by Friedreich,[2] of Heidelberg. The needle of the syringe, he advised, should be introduced into the sac through the abdominal or vaginal walls, a few drops of fluid should then be with-drawn, and its place supplied by the solution containing the poison selected. Friedreich employed by preference one-fifth of a grain of morphine. The operation was repeated every second day, until the diminished size of the ovum afforded evidence that the result sought for had been accomplished. The operation seemed to produce but slight inflammatory disturbance, and the maternal system did not feel the influence of the narcotic. Rennert[3] has since succeeded in destroying the life of the fœtus in the fifth month of extra-uterine gestation by means of a single injection containing about half a grain of morphine. The patient recovered after a protracted illness. Koeberlé reported to the Gynæcological Section of the Eighth International Medical Congress at Copenhagen a case of advanced abdominal pregnancy where the child was destroyed by morphine injections. The fœtus and placenta were absorbed. The recovery was complete. Ten cases have been observed by Winckel and one by Fournier. Of the sixteen cases, three have ended fatally.

Winckel,[4] who is the chief modern advocate of this method, makes an injection of the strength of half a grain of morphine through the abdominal wall, above Poupart's ligament, and repeats the same after six to eight days. Two to three injections usually suffice. As a result of the death of the fœtus, the pains subside, the abdomen becomes soft, the swelling rapidly diminishes in size, the appetite returns, and convalescence follows. The method is applicable up to the end of the fourth month.

The Faradic Current.—The transmission of the faradic current is accomplished by passing one pole into the rectum or vagina to the site of the ovum and pressing the other upon a point in the abdominal wall situ-ated two to three inches above Poupart's ligament. The full force of the current of an ordinary one-cell battery should be employed for a period varying from five to ten minutes. The treatment should be continued daily

---

[1] Traité complet des accouchements, p. 968.

[2] Cohnstein, Beitrag zur Schwangerschaft ausserhalb der Gebärmutter, Arch. f. Gynaek., Bd. xiv. S. 355. Hennig likewise reports a case operated on by Koeberlé, where profuse hemorrhage occurred. It is not stated whether the patient recovered. (Die Krank-heiten der Eileiter und die Tubenschwangerschaft, S. 138.)

[3] Extrauterinschwangerschaft im fünften Monate, Arch. f. Gynaek., Bd. xxiv. S. 266.

[4] Lehrbuch der Geburtshülfe, zweite Auflage, S. 269.

for one or two weeks, until the shrinkage of the tumor leaves no doubt as to the death of the fœtus.

The successful employment of the faradic current in extra-uterine pregnancy we owe to Dr. J. G. Allen, who reported two cases of recovery through its instrumentality in 1872. His first case occurred in 1869 and the second in 1871. So little pains did he take regarding his discovery that the subject was nearly forgotten, until a new success was reported by Drs. Lovering and Landis, of the Starling Medical College, in 1877. Since then, Brothers [1] has collected fifty cases in which electricity was employed. In twenty-five cases, to which I can add a twenty-sixth from my own practice and not included in Brothers's list, the health of the patients was ascertained to be good at the end of periods varying from one to eight years.

There were no evil results in any of the cases traceable to the electricity. Of the four fatal ones, in that of Janvrin rupture of the tube had undoubtedly taken place before the galvanism was employed, in that of Wylie the eight months' fœtus was killed by injections of morphine into the sac after electricity had been discarded, and in the cases of Duncan and Steavensen and Boulton and Steavensen electro-puncture was employed.

The treatment by means of faradism is available only during the first three months, and in the intra-ligamentous form of ectopic gestation.

The arguments against faradism are the usual ones urged against all conservative measures,—viz., that reported successful cases were simply examples of diagnostic errors, and that hesitation to resort in every case to abdominal section is *prima facie* evidence of surgical incompetence. The difficulties of diagnosis, however, are small in the case of a growing intra-ligamentous fœtal sac, and it is not necessary to abandon a tenable position simply because of slurring comments. In conclusion, I am willing to admit theoretically that the ovum, after its vitality has been destroyed, may be a source of discomfort and may require removal ; but it must be borne in mind that a small dead ovum between the folds of the broad ligament is usually innocuous and gives rise to few of the symptoms resulting from tubal distention.

2. *Cases of Advanced Gestation.*—After the third month it has now come to be regarded as a settled rule that the removal of the fœtus, the placenta, and the investing membranes should be attempted as soon as the diagnosis has been made. If complete extirpation of the sac proves impracticable, it should be removed to the fullest extent possible, as its presence when left *in situ* is capable of leading to intractable sinuses and persistent suppuration. The older method of stitching the sac to the abdominal wall and leaving the placenta to come away spontaneously furnished a certain number of favorable results after the death of the child and the arrest of the cir-

---

[1] Subsequent Behavior of Cases of Extra-Uterine Pregnancy treated by Electricity, American Journal of Obstetrics, vol. xxiii., No. 2, 1890.

culation had taken place. During the life of the child, death from hemorrhage was the usual result.[1] The conclusion drawn from this experience was to await the death of the fœtus before operating; but the statistics of Schauta confirm the apprehension that, what with rupture of the sac, intestinal and visceral perforations, and sepsis, there is but slender hope of a happy issue when a waiting policy is adopted.

With clearer anatomical views of extra-uterine pregnancy, it is more and more recognized that the treatment of that condition is subject to the ordinary rules of abdominal surgery.

The difficulties encountered in the removal of the fœtal sac are the result of excessive vascularity and extensive adhesions, but these obstacles to success have of late been found in many cases not to be insurmountable. The first operator to move in the right direction to lessen the risks of hemorrhage and sepsis was Martin, who detached the placenta after tying the supplying vessels in the broad ligament beneath the placenta and at the side of the uterus. This he did in 1881, in the days of imperfect Listerism. The patient was in the seventh month of pregnancy. The sac was afterwards closed on the peritoneal side, and drainage was accomplished through an opening made into the vagina.

Breisky,[2] however, was the first to place the operation on a solid surgical basis by showing that it is practicable to remove the entire ovum. His patient was at the end of the eighth month of pregnancy. He first stitched

---

[1] John Williams has reported a successful case belonging to this category (thirty-five weeks' gestation). The placenta continued to discharge for about five weeks. The patient returned home at the end of two months. (Obstetrical Transactions, London, vol. xxix. p. 482.)

Jessup (London Obstetrical Transactions, 1876, p. 261) and John W. Taylor (Ibid., 1891, p. 115) removed at term children that were free among the intestines. In both cases the cord was drawn out of the lower corner of the wound, and through the opening thus left the putrescent placenta was gradually discharged. Jessup's patient left the hospital after two and one-half months; Taylor's, after three and one-half months.

Dr. Mordecai Price, of Philadelphia, delivered a living child by section in the tenth month of pregnancy, October 23, 1892. The sac was adherent to the transverse colon and to the small intestine to a small extent. The placenta was attached to the left tube, to the entire pelvic viscera on the left side, and to the descending colon. Owing to the certainty of fatal hemorrhage in case of detachment of the placenta, the sac was stitched to the abdominal wall. At the end of the third week the patient's condition seemed desperate, but she ultimately recovered, and the child was living at the end of fifteen months. (Philadelphia Medical and Surgical Reporter, May 20, 1893.)

Brühl (Arch f. Gyn., Bd. xxxi. S. 404), in a patient presumably six months pregnant, stitched the sac to the abdominal walls and packed with iodoform gauze. The child breathed a few times. The patient was discharged at the end of seven weeks.

Treub (Zeitschr. f. Geb. und Gyn., 1888, Bd. xv. S. 384) operated successfully three weeks before the end of gestation. The placenta was removed and the sac was partially resected. The latter was then stitched to the abdominal wall and tamponed with iodoform gauze.

Lihotzky (Wien. Klin. Wochenschr., 1891, S. 184) operated after the same method at the seventh month, with good recovery of the patient.

[2] Wiener Med. Presse, No. 48, 1887.

the sac to the abdominal wound, opened it, and removed the fœtus. He
then removed the stitches, ligated the broad ligament on the side of the
uterus, and separated the tumor, tying at the same time any large vessels
found bleeding in the cut surface. By progressive ligation of the base
from within outward towards the pelvic wall, the sac with the contained
placenta was detached with slight loss of blood. Packing the cavity with
iodoform gauze was subsequently resorted to.[1]

A year later our own Eastman[2] removed the entire sac in an ectopic
pregnancy of the tubal variety at the eighth month. He was able to clamp
the uterine end of the tube and the broad ligament and to cut away the
portion which contained the ovum. He afterwards quilted the stump with
iron-dyed silk. The patient made an excellent recovery. The operation
of Eastman stands as one of the finest achievements of American surgery.

Olshausen[3] found the placenta attached to the right broad ligament.
By tying the ligament beneath the placenta, the latter was removed without
loss of blood. Again, in a like case, Braun Fernwald[4] tied the broad liga-
ment to which the placenta was attached, and thus removed the upper por-
tion without difficulty, but on the posterior surface of the uterus and in the
cul-de-sac the separation was not practicable. He therefore amputated the
fundus of the uterus, after applying an elastic ligature, and stitched the
funnel-shaped cavity of the cul de-sac of Douglas to the abdominal wound
and filled it with iodoform gauze. The operation was performed on the
11th of February, and the patient was discharged cured on the 13th of
April.

Now, while these successes favored the belief that a large number of
cases of ectopic pregnancy in the second half of gestation were amenable
to surgical treatment even when the child was living, it has been maintained
that in cases in which the sac occupies the entire extent of the ligamentous
folds it is the part of wisdom to refrain from interference until the death
of the child takes place and the placental circulation is arrested. But on
the 10th of January, 1891, Schauta[5] successfully applied to a case of the
kind the principles which govern the removal of intra-ligamentous ovarian
cysts. After tying the ovarian artery at the peritoneal fold, which con-
stituted the residue of the ligamentum infundibulo pelvicum, he incised the
peritoneal covering in a circular line corresponding nearly to the largest
circumference of the sac. The enucleation of the latter was readily accom-
plished without rupture of the sac-walls. Considerable hemorrhage resulted
from the detachment of the ovum from the uterus. This was temporarily

[1] Lazarewitsch, of Kharkoff, reported in 1886 a case in which he extirpated the entire
sac with a favorable result.   The particulars I have not been able to obtain.
[2] American Journal of Obstetrics, vol. xxi., September, 1888.
[3] Deutsch. Med. Wochenschr , 1890, S. 174.
[4] Arch. f. Gynaek, Bd. xxxvii. S. 286.
[5] Beiträge zur Casuistik, Prognose und Therapie der extrauterin Schwangerschaft,
Prag, 1891.

controlled by pressure and later by sutures. The peritoneal borders of the cavity were then sutured to the parietal peritoneum, and the cavity itself was drained by a Mikulicz tampon.

On the 4th of February, 1890,—*i.e.*, nearly a year previous to the case of Schauta,—Professor Rein,[1] of Kiew, reported a successful operation in the thirty-seventh week of pregnancy. He stated that the fœtus, the placenta, and all the membranes were removed by enucleation from the peritoneum in precisely the way resorted to in intra-ligamentous ovarian cysts. The mother made a good recovery. The child was alive two years later. The particulars of this interesting case are not given.

After a careful study of Schauta's case, I decided to operate on the 19th of April, 1893, upon a patient presumably six months pregnant. As the case is one which illustrates most of the difficulties of removing an intra-ligamentous sac, I shall take the liberty of relating it *in extenso*. The abdominal incision extended from about two inches above the navel to the symphysis. The exposed tumor had the reddish-blue aspect of the pregnant uterus. The small intestines were everywhere adherent to its upper portion. The descending colon was displaced inward and pursued an oblique course from the iliac fossa towards the ensiform cartilage. The uterus was attached to the tumor by its lower posterior surface and was deflected to the right of the median line; its fundus and lateral surfaces were well defined. On the right side a portion of the tube about half an inch in length extended from the right cornu to the sac. The left tube was of normal dimensions, and was apparently attached to the sac by a short fold.

The sac was subperitoneal. Its lower segment occupied the entire pelvic space. It was attached to the posterior surface of the uterus beneath the peritoneal covering. There was no pedicle indicated. It was clear that the pregnancy had started in the right tube and had subsequently developed to a great extent between the folds of the broad ligament. The abdominal portion of the tumor contained, as shown by the contractions, and subsequently by microscopical examination, muscular fibres, presumably derived from the tubal walls.

I at first attempted to separate adherent intestines; this, however, was somewhat difficult and was associated with profuse bleeding from the sac-surface. I was therefore obliged to desist and to proceed first to tie the ovarian arteries. Access to the vessel at the right ligamentum infundibulo-pelvicum was difficult, as the sac was everywhere in close contact with the pelvic wall. Two ligatures were easily applied at the uterine insertion. For further security I tied the left ovarian artery, which apparently distributed vessels to the covering of the ovum. These ligatures controlled the bleeding to a marked degree. I then cautiously cut down through the walls of the enveloping sac to the ovum, about two inches above the fundus

---

[1] Zur Laparotomie bei extrauterin Schwangerschaft, Centralblatt für Gynaek., No. 50, December 17, 1892.

of the uterus, and rapidly enlarged the opening in a transverse direction with blunt-pointed scissors. The separation of the ovum was easily effected by the fingers. I had intended to follow the example of Schauta and remove the ovum entire, but before the work was completed the sac ruptured and a living fœtus escaped. As rupture was followed by increased hemorrhage, I directed my assistant to compress the aorta while the enucleation was completed. Fortunately, this was accomplished in a few seconds. The hemorrhage which followed from the placental site was promptly controlled by packing the cavity with iodoform gauze. My assistant next transferred his fingers from the aorta and pressed the gauze firmly downward into the bleeding space.

Afterwards I was able to detach leisurely the remnants of membrane which were adherent to the intestines and to tie off the residue of the sac-walls which extended from the uterus along the site of the affected tube. When the work was finished, there remained of the original cavity only the space between the ligamental folds and the denuded posterior uterine wall.

After the trimming had been completed, the packing was withdrawn and was quickly replaced by a Mikulicz pouch, into which were crowded two strips of gauze, each a yard and a half in length by a half-yard in width. The abdominal incision, so far as the pouch permitted, was then closed. The operation lasted about fifty minutes, and was performed in the presence of upward of one hundred and fifty spectators.

The child moved its limbs after its birth, and, though nothing was done for its preservation, it lived for twenty-six minutes. It measured between eleven and twelve inches in length, and weighed about twenty-four ounces. It had fine hair upon its head. There was some fat in the cellular tissue, but no lanugo and no vernix caseosa. The eyelids were separate, and the pupillary membrane was still distinct. The nails did not reach to the tips of its fingers. It was evidently well advanced in the sixth month.

The patient suffered a good deal from shock following the operation. The temperature sank to 95.6° F., but in the evening she rallied. At nine P.M. the dressings were found soaked with serum tinged with blood. Afterwards the amount of discharge was moderate.

The pulse was rapid (112 to 140) during the first two days. The temperature remained normal until the fifth day. It then rose to 101.8° F., and the patient suffered a good deal from tympanites. She was given three grains of calomel, and an enema of chamomile infusion was administered. A portion of the gauze dressing was removed. On the following day (the sixth) the patient had many watery stools; the pulse and temperature were thereafter normal, but she had much discomfort, and the face had a pinched aspect until the 28th of April (the ninth day), when the stitches and the remainder of the gauze were removed. Convalescence has since then been uninterrupted. The patient has regained her flesh and color, and the sinus has nearly closed.

So far as I have been able to obtain records, there have now (1894)

been reported sixteen successful cases of cœliotomy performed with the fœtus living in the second half of ectopic pregnancy,—viz., those of Breisky, Braun, Eastman, Jessup, Rein, Lazarewitsch, Lusk, Martin, Olshausen, Schauta, Taylor, Treub, John Williams, Brühl, Lihotzky, and Mordecai Price.

While it is evident that much remains in the way of perfecting the technique of the primary operation in advanced extra-uterine gestation, the evidence herewith presented is sufficient to show that under the most difficult circumstances it is not necessary to fold the hands and await the occurrence of a miracle.

As an example of modern surgical resources, Mackenrodt relates that, in the case of a woman who was insensible and pulseless from internal hemorrhage due to a ruptured tube, he inserted at the time of operation a tranfusion-tube into each mamma, and thus introduced into the system an abundance of a saline solution. No chloroform was given. The operation was short. During the application of the binder the pulse returned to the wrist. The patient became conscious and recovered. Dührsen reports a similar success.

3. *Cases of Gestation after the Death of the Fœtus.* After the death of the fœtus the same principles hold good so long as the sac-contents have not been infected. After putrefaction or pus-formation has set in, the older method of stitching the sac to the abdominal incision previous to opening it is still the best.

The question as to whether the placenta should be detached and the sac filled with a Mikulicz bag, or whether it should be left in place to separate spontaneously, is unsettled. In the latter case it has been found useful to strew the inner surface of the sac with a mixture of tannin and salicylic acid, to act as a styptic and disinfectant. In many instances the walls are too friable to admit of gauze packing.

THE INTRA- AND EXTRA-PERITONEAL FORMS OF PELVIC HÆMATOCELE.

The term pelvic hæmatocele is applied to encysted collections of blood in the pelvic cavity. It is customary to distinguish the intra-peritoneal form, situated, as a rule, behind the uterus, and the extra-peritoneal variety, or, as it has been better termed, "hæmatoma," between the folds of the broad ligaments.

Intra-Peritoneal Pelvic Hæmatocele.—In intra-peritoneal hæmatocele the encysted blood is usually situated behind the uterus, which it pushes upward and forward against the pubis, while below it forms a tumor between the rectum and the vagina. The effusion itself is shut off from the abdominal cavity by adhesions between the small intestines, the sigmoid flexure, the cæcum, the genital organs, and the abdominal walls. In extreme cases it may reach as high as the navel. The sac is subject to movements communicated to it by the diaphragm. When the hemorrhage is considerable, the blood may rise above the ligamenta lata and the uterus

and occupy space to the front as well as to the rear of these organs. In very rare cases the encysted blood occupies an anterior situation between the vagina and the bladder.

According to Nélaton, Bernutz, and all the earlier French writers, the visceral adhesions which serve to complete the capsule in which the blood is contained form after the outpouring of the blood. Virchow and his followers, on the other hand, have maintained that antecedent adhesions rendered hæmatocele formation a possibility.

While it may be true that, in moderate hemorrhages, the blood-escape may be circumscribed by secondary adhesions, it is to be borne in mind that ordinarily normal blood is rapidly absorbed by the normal peritoneum. A hæmatocele requires either a hemorrhage of an irritating character which excites a local peritonitis, or a peritoneum thickened by previous inflammation. Modern cœliotomies have shown that the way is, in many instances, prepared by the peritonitis and the matting together of the pelvic viscera incident to a variety of tubal disorders.

The outpoured blood rapidly undergoes coagulation. Membranes, at first soft and glutinous, but speedily becoming of a cartilaginous consistency, form around the clots. Subsequently the peritoneum thickens and fills with vessels of new formation. These membranes, when of long duration, frequently leave behind a permanent thickening between the vagina and the rectum.

The blood in hæmatocele is largely of tubal origin, and is effused most frequently at the menstrual period. A considerable number of cases of hæmatocele is doubtless the result of ruptured tubal pregnancy and of tubal abortion, where favoring conditions—viz., peritoneal thickening and matted viscera—often exist at the time of the hemorrhage. The theory of ectopic pregnancy as the exclusive source of the affection has been rightly disputed. In the non-pregnant state autopsies have shown that blood may be poured from the tubes as a consequence of menstrual disturbances or of rupture of varicose veins. In rare cases, too, hemorrhages may proceed from Graafian follicles, or from hemorrhagic peritonitis, or may be due to a reflex from the uterine cavity in excessive menorrhagia or metrorrhagia.

The symptoms vary according to the severity of the attack. There is no initial chill. The attack is sudden, the patient often complaining at the outset of a feeling as though something had given way; at the same time a sharp pain is experienced, of a peritoneal character, which compels the sufferer to go to bed. The pains are confined to the pelvis, or radiate over the entire abdomen, or down the thighs along the course of the crural or sciatic nerves.

The hemorrhage which forms the basis of a hæmatocele occurs usually at a menstrual period. Menstruation is often temporarily suppressed, returning later, however, as an irregular hemorrhage. For the first week the latter is often profuse; afterwards it has a dark, grumous character,

and may continue for weeks. Fehling believes the bleeding to result from an associated interstitial endometritis. If the hemorrhage is very profuse, the patient may become pallid, and suffer from palpitation, yawning, and vomiting, due to acute anæmia. Owing to peritonitis and anæmia, the pulse becomes more rapid (100 to 140), the appetite is lessened, thirst is experienced, and the tongue is dry and coated. Fever is usually absent, or, if present, the temperature rarely exceeds 101° to 102° F. Constipation is the rule. Urination is frequent, difficult, and painful.

So long as the blood is fluid it cannot be well made out by percussion. After coagulation the tumor can be readily determined by bimanual palpation. At first it has an elastic softness; later it becomes dense, nodular, or preserves a partly fluctuating character. By it the rectum is flattened antero-posteriorly, the bladder is dragged upward, and, as has been already mentioned, the uterus is pushed upward and forward against the pubic wall. With the dislocation of the pelvic organs the patient experiences a constant desire to empty the bladder and the rectum.

The prognosis is generally favorable, though, as a result of exertion, of digital examinations, of purgative medicines, or of a return of the menses, a renewal of the hemorrhage is possible.

The usual outcome is absorption. The tumor becomes smaller, harder, and less painful, the uterus returns to its normal position, and the visceral and rectal tenesmus cease. Very rarely, in consequence of the invasion of pathogenic germs, fever is set up, the pains return, suppuration occurs, and perforation takes place usually into the rectum, or more rarely into the bladder or vagina or through the abdominal walls. When the discharge takes place externally, relief is afforded to the patient; when into the peritoneal cavity, death speedily ensues.

The diagnosis is usually easy. The sudden attack, its occurrence at the time of menstruation, the signs of internal hemorrhage, the absence of fever, the rapid formation of the pelvic tumor, and the displacement of the pelvic viscera are sufficiently characteristic. By careful palpation, if necessary under an anæsthetic, it is possible to outline through the rectum the posterior surface of the hæmatocele, and to determine through the vagina the independence of the uterus.

The treatment is mainly expectant. At the outset, cold to the lower abdomen to restrain hemorrhage, prolonged rest in bed, the use of the catheter, if required to empty the bladder, and time (four to six weeks) usually suffice for a cure. I do not personally remember a single instance where surgery was needed to secure a happy issue. In a case of excessive distention of not too recent origin, or suppuration, there is no valid objection to a vaginal incision made with the intent to empty the sac-cavity. Gusserow [1] employed this method in a number of instances to shorten the period of convalescence or to relieve serious symptoms resulting from local press-

---

[1] Arch. f. Gynaek., Bd. xxix. S. 389.

ure. His plan consisted in washing out the vagina with corrosive subli-
mate solution (1 to 2000), in vaginal incision, and in irrigation of the
sac with a solution of salicylic acid. If the cavity had distinct walls, these
were attached by sutures to the vaginal wound; afterwards a drainage-
tube was introduced into the sac and the vagina was packed with iodoform
gauze. Gusserow deprecates the use of the curette, and warns against
making an opening per vaginam before time enough has elapsed to insure
against a renewal of the hemorrhage. Indeed, should circumstances arise
calling for interference at an early stage of the malady, an opening from
above, after cœliotomy, would possess the advantage of enabling the oper-
ator to secure bleeding points under the guidance of the eye.

Extra-Peritoneal Pelvic Hæmatocele (Hæmatoma). — This
term is applied to effusions of blood which take place beneath that portion
of the peritoneum which covers the pelvic space. Usually it results from
the rupture of vessels during menstruation, or it may be secondary to tubal
pregnancy, or to rupture of the lower segment during childbirth. As a
rule, the hæmatoma develops between the folds of the broad ligament, some-
times occupying the entire space, or, again, forming circumscribed tumors
in the upper portions of the ligament. Less frequently the peritoneum
may be lifted from the cervix and the bladder. As a rule, the swelling
occupies one ligament only. Sometimes the effusions are bilateral. They
may even dissect up the entire pelvic peritoneum so that the pelvic viscera
are bathed in blood. The sac thus formed is of irregular shape, with
pocket-like recesses, and is here and there traversed by filaments of con-
nective tissue. The effused blood undergoes the usual changes. Coagula-
tion takes place, followed by absorption of the fluid portion; the clot
then adheres to the ragged surface of the sac and is slowly absorbed, or may
remain in part unchanged for months.

Rupture of the peritoneal walls may take place either at the beginning
of the attack as a consequence of pressure, or at a later date as the result
of a disintegration of the sac-contents. Disturbances of circulation are
produced by the presence of the tumor, as evidenced by œdema and thrombi
in more remote tissues, by apoplectic effusions into the ovaries, and by the
development of a hemorrhagic endometritis in the uterus.

The disease is characterized by the suddenness of the onset, by the
colic-like pains, by the intense anæmia ensuing from the loss of blood, and
by the absence of fever. The menstruation is often, at first, arrested for a
short time. The patient experiences a constant inclination to empty the
bladder and the rectum. The tumor is usually at the side of the uterus;
only in exceptional cases it has a bilateral seat, or is found in front of the
uterus. On the side not affected the uterus can be outlined by the finger.
Through the rectum the cul-de-sac of Douglas is found to be empty. In
contradistinction, inflammatory exudations are characterized by a long
preceding illness and are attended by chills, high temperature, and acute
pain.

Gusserow[1] lays stress upon the convexity of the tumor at the pelvic brim in hæmatoma, while the effusion is reached with difficulty through the vagina. In hæmatocele, on the other hand, the blood poured into the cul-de-sac pushes down between the vagina and the rectum, and is definable above only when the space is filled to a marked degree. The prognosis is favorable. Fatal results from internal rupture are exceedingly rare. The treatment is for the most part expectant. In the rare cases where either the local disturbance or the non-absorption of the clots renders interference advisable, an incision can be made as in hæmatocele per vaginam, with due regard to asepsis and drainage; but the irregular, sacculated character of the tumor-walls and the uncertainty attending work done from below lead one to ask whether greater safety is not obtained by abdominal section, as has been especially advocated by Martin.[2] By this method the entire contents can be removed, bleeding points can be secured, and, after drainage has been established by the vagina, the peritoneal incision can be closed by sutures.

---

[1] Arch. f. Gynaek., Ueber Hæmatocele periuterina, Bd. xli. S. 400.
[2] Pathologie und Therapie der Frauenkrankheiten, dritte Auflage, S. 396.

CHAPTER XV.

FUNCTIONAL DISEASES.

BY CHAUNCEY D. PALMER, M.D.

MENSTRUATION.

MENSTRUATION is a periodic function of the uterus, the rhythmic performance and physical changes of which, local and general, occur in the human female for about thirty years.

Synonymes.—Menses, courses, periods, turns, catamenia, and "unwell." Of all these terms the most appropriate are "the menses" and "menstruation."

What is it? The menstrual flow consists of blood associated with broken-down epithelium, squamous and ciliated, mucous secretion of the uterus and vagina, and at times débris of the uterine mucous membrane with tubular glands. The latter is very properly called *decidua menstrualis.*

At first slimy, because of the accompanying mucus, thin and pale, it soon becomes dark, of the color of venous blood, growing pale towards the close of the function. Its odor is peculiar and characteristic, and is due to fatty acids and the secretion of the genital glands.

The average quantity is from four to five ounces. There are great variations within the bounds of health. Every woman is a law to herself.

The blood discharged is alkaline in reaction, like ordinary blood, and free from clots, because of its admixture with mucus. There is a hypersecretion from the uterus and the vagina prior to, during, and after the flow, which if slight and temporary is purely physiological, but if excessive and long continued is morbid. A uterine leucorrhœa always begins in this manner.

The duration of the flow varies greatly : the average is from four to five days.

The appearance, odor, quantity, and quality of the menstrual flow are subject to many variations within the bounds of health and disease. Thus they are modified by age, social condition, diet, climate, the degree of physical exercise to which the female is accustomed, and her amount of physical vigor. How the flow is altered by disease will be mentioned hereafter.

The menstrual flux comes from the corporeal cavity of the uterus above the internal os. In some cases it may come partly from the Fallopian tubes; but this is exceptional.

The age at which menstruation first appears is influenced by race, climate, mode of life, and other conditions. Tilt's observations were that Hindoo women in Calcutta menstruate before they are twelve years old, while negroes in Jamaica begin at the average age of fifteen. The usual time of inception of menstruation in temperate climates is at the age of fourteen. In tropical climates it begins earlier, as at twelve; in extremely cold climates, as in Northern Russia or in Greenland, later, between sixteen and twenty-three. It is estimated that for every ten degrees of latitude farther north or south the menstrual commencement is one year later or earlier. Brunettes generally menstruate earlier than blondes. The earliness of its inception is likewise influenced by city life. City girls commence earlier than their rural sisters, owing to the stimulating influence of social life and more frequent communication with males in recreation and play. Its early appearance in Turkey and India is partly due to premature and improper association of the sexes. It is also earlier in higher life, where there are luxurious habits and indiscreet reading and society. Premature sexual excitement does not necessarily coexist.

Severe labor, hardships, and privations retard it. Its late appearance is sometimes the *result* of constitutional ill health, and not its cause, as is so often supposed. Aside from this, it may be due to tardy or imperfect development of the internal genitalia.

Normal menstruation, when the function has been well established, recurs about once in twenty-eight days, or a lunar month. More rarely it appears at or near the same day of each calendar month.

When menstruation is about to occur, the whole aspect of the female changes: she becomes more modest and shy, the face easily flushes, and the entire demeanor changes. Coincidently with this performance of the uterine function, from a renewal of the growth of the uterus, there is a noticeable mammary growth, and widening of the form, from a development of the pelvis. There is also a growth of hair on the pubes and in the axillæ. The whole contour of the body becomes more rounded and attractive. The uterus, the mammæ, and the pelvis continue developing until the age of twenty, when they are matured—the time of nubility.

Precocious Menstruation.—Numerous cases are on record in which menstruation has occurred at a very early age, as from a few days after birth to within the first, second, third, fourth, or fifth year of life, soon followed by the other evidences of puberty above enumerated. In these cases there is a premature, but well-formed, miniature woman, physically speaking, but the mental development is not correspondingly precocious, and the bodily appearance oftentimes leads to uncalled-for expectations and unnecessary exactions from her instructors. The ability for procreation, though rarely tested, no doubt exists. In one case pregnancy and partu-

rition at term occurred at nine years and seven months. This girl commenced to menstruate at twelve months, became pregnant about six weeks before she was nine years old, and after a labor of six hours was delivered of a child weighing seven pounds. The youngest American mother on record was ten years and thirteen days old. She weighed one hundred pounds and was four feet seven inches high; she commenced to menstruate at one year.

Hemorrhage from the genitals of new-born girls must in general be owing to the same causes as hæmatemesis, melæna neonatorum, umbilical hemorrhage, or the epistaxis of infants. These conditions are involved in more or less obscurity. The blood then is always faulty in its composition, with a feeble coagulability, and with a marked fluidity; or there is some abnormal state of the walls of the minute vessels, and a diathesis of hæmophilia, inherited, or dependent on obscure causes, if there is a good family history. A hemorrhagic diathesis may pass from one generation, to reappear in another, in cases of this kind. Congenital syphilis is a recognized cause, creating marked blood dyscrasia in an infant. There may also be a disturbance of circulation, leading to a congestion of the finer capillaries.

Menstruation commonly ceases at about forty-five; earlier, if it has begun very early in life. Morbific influences may cause either its much earlier cessation or its undue continuance. Thus, chronic metritis, in its third stage of sclerosis or cirrhosis, may cause a premature cessation at thirty, thirty-five, or forty; so, also, may superinvolution of the uterus. More often it is continued until later than forty-five, as to fifty or even fifty-five or sixty. Abnormally prolonged menstruation has a satisfactory explanation in many morbid causes, as granular endometritis, or uterine fibroids, polypoids, or cancer.

Menstrual cessation indicates ovarian atrophy. The ovaries shrink, shrivel, and become harder, whiter, and less vascular. Corresponding changes take place in the uterus, vagina, and mammæ. Thus, most of the sexual organs shrink and undergo a physiological atrophy. We are not to infer that the ovaries have ceased their function because menstruation has stopped. As ovulation is in many instances carried on before the menses appear, so it may be continued many years after their cessation.

The interval between the beginning and the end of menstruation constitutes a period of about thirty years, subject to many variations, physiological and pathological, mental, moral, and physical. As stated, many years may be consumed in the total suppression of this function. If the woman is perfectly healthy, her menses appear less and less frequently, the intervals becoming gradually longer, the duration of each time of flow shorter, and the quantity less. In this way the system becomes accommodated to the local and general menstrual changes, with the least physical and mental disturbance.

Menstruation is attended by certain phenomena, local or pelvic, general

or constitutional, which are to be considered. The mucous membrane of the uterus thickens, becomes softer and of a deeper color, and is folded and mammillated. The uterine glands enlarge, and their secretion becomes excessive in amount. The decidua menstrualis is formed from the uterine mucous structure. Its maximum growth immediately precedes a menstrual flow, a few days prior to which it undergoes a fatty granular degeneration, and during which it is exfoliated more or less, leaving bare many bleeding blood-vessels. Just how much of the membrane is cast off at each menstruation, and whether the mucous glands are destroyed or not, is a debatable question.

The views of Williams, who has studied this matter much, are as follows. The uterine mucous membrane undergoes fatty degeneration, its vessels rupture, and an extravasation of blood ensues, especially near the surface, for it is there that fatty degeneration is most advanced. The glandular portion of the mucous membrane is shed. This theory presupposes an entire removal of the mucous membrane, down to the muscular fibres, and a regeneration from groups of round cells of the mucous coat.

It is more generally believed that the deeper layers and glands of the mucous tissue remain intact, and that the exfoliated layers are replenished with rapidity after a menstrual period has passed, ten days being sufficient. Ercolani thinks that the decidua menstrualis is formed by a rapid growth of cells derived from and replacing the ciliated epithelium. Kundrat and Engleman maintain, what is probably true, that only the superficial layer of the mucous membrane is shed at each menstrual period. Möricke asserts that during menstruation the mucous membrane disappears entirely. These expressed views show how widely microscopists differ.

Menstruation probably marks a destructive process, following a constructive process of growth of the decidua and the development of the Graafian follicles. The decidua is formed in preparation for the reception of the ovum. Should impregnation result, the decidua menstrualis is converted into the decidua vera, the same tissue in kind, but larger and thicker.

The uterus is always larger and heavier (volume one-third more) and somewhat softer during menstruation than at the middle of the inter-menstrual periods. The pampiniform plexus becomes engorged and enlarged. The cervix is larger, softer, and of a violet color. The os externum and os internum are more open. The physiological hyperæmia and the results do not pass away altogether until one week after the cessation of the flow.

Menstruation is a neurosis, indicating anatomical changes, a hyperplastic action, a degeneration of tissues, and a reparative process. This periodical discharge of blood is the result of a physical conformation, inherent and peculiarly dependent upon ultimate cell changes in the cerebro-spinal centres, transmitted to the generative ganglionic system, producing a pelvic fluxion, a uterine and ovarian hyperæmia. A menstrual hypertrophy ensues. The fatty degeneration and the disintegration of the uterine lining are not the causes, but the results, of the menstrual molimen. They

corroborate the theory that menstruation is the result, and not the cause, of uterine action.

The trophic nerves govern and equalize the movements of fluxion and the erectility of the female pelvic organs. Emotional and psychical causes give rise to molecular changes, evidenced by a sudden menstrual suppression.

Ovarian erectility and motility are not unlike erection in the male. The corpora cavernosa and corpus spongiosum of the male organ are made up of venous sinuses; so the uterine and peri-uterine spaces are furnished with cavernous sinuses and plexuses, possessed of the same wonderful capacity of rapid unloading and filling. The female generative tract is capable of enormous venous engorgement.

The general phenomena attending menstruation are a somewhat diminished appetite, impaired digestion, and not infrequently diarrhœa and increased micturition. Pigmentation under the eyes and on the face is sometimes noticed. Meteorism is at times present. The glandular system is stimulated. The sudoriferous and sebaceous glands are more active. There is general malaise, with frequent yawning. Both physical and mental vigor are diminished, and there is some mental depression. The face is usually wan and pale. There is a small decrease in weight and a slight fall in temperature. Vascular and nervous tension are somewhat on the decline. Following the cessation of the menstrual flow there is, coincident with a repair of the corporeal mucous membrane, a gradual reconstructive process going on in the body at large. The blood-supply generally increases, the body gains in weight, vigor heightens, vascular and nervous tension augment, and the temperature of the body rises about one half a degree Fahrenheit (Kiwisch), all of which phenomena, local and general, conclusively prove that menstruation is not a local process, but a general physiological action, a menstrual cycle, finding its local expression in the generative organs. Corroborative evidence of this accepted theory of the menstrual cycle is afforded in the changes which occur at times in some of the morbid processes of the body. Nævi enlarge and assume a deeper color prior to the menses; so do varicose veins of the lower extremities. Menstrual headaches are quite often due to the vascular and nervous changes incident to this function.

To a certain degree the menstrual flux has a depurative influence on the blood: it is a process of purification, in the Mosaic sense. To this periodical discharge of blood the body at large becomes habituated. Its sudden arrest induces abnormal symptoms, from vascular and nervous disturbances. Nature, from conditions of the nervous system back of and beyond the internal genitalia, at times attempts to give vent to this vascular tension by establishing a vicarious discharge of blood from other parts of the body, as the nose, the bronchi, or the rectum. Finally, menstruation is a miniature gestation and parturition,—a gestation, so to speak, of from twenty-three to twenty-five days, and a parturition of four or five days.

As menstruation, conception, gestation, and parturition are the various

functions of the uterus, and as these are intimately connected with the function of the ovaries, or ovulation, it becomes necessary to consider their mutual relationship.

When does the Graafian follicle discharge its ovule? The older view is that the ovule is discharged following menstruation. The newer view, advanced by Raciborski, is that when the menses have commenced the ovule has already escaped. Both views are doubtless correct, for there is no invariable rule for all cases. Most impregnations occur within a week following the end of the menses. Many, without doubt, occur before, as proved by the duration of gestation and the conduct of the last menstruation. Some women are at times cognizant of the escape of the ovum, and may prevent an impregnation by avoiding coitus for a week after the end of the menses.

How many ova are discharged at each time? There is no rule as to this. One ovum or many may be expelled, from one or more Graafian follicles, in one or both ovaries, at a certain period of ovulation.

It was formerly held that menstruation was dependent upon ovulation. The newer view, which is well supported, is that menstruation and ovulation are more or less independent of each other.

What reasons are there for believing that women have ovulation without menstruation, not considering cases where there is no uterus?

(a) Ovules have been found in the ovaries of young girls; (b) ovarian tumors, presumably developed from Graafian follicles, have also been found in young girls; (c) pregnancy has occurred prior to menstruation and puberty; (d) pregnancy has occurred during lactation; (e) pregnancy has occurred after the menopause; (f) post-mortems have shown the evidences of previous ovulation, by the existence of a corpus luteum, when there has been no previous menstruation.

All these facts are rather negative evidence and proof of that regarding which we all agree, the occurrence of ovulation without menstruation. But what proof have we that menstruation may, or does, occur without ovulation? This fact is of course more difficult to prove. The evidence is:

(a) The occurrence of menstruation when no Graafian vesicles have ruptured, as shown post mortem; (b) the occurrence of menstruation after single, and especially after double, oöphorectomy or ovariotomy.

Many cases—at least several hundred—are now reported in which menstruation has continued after both ovaries have been removed. The majority of these patients had regular monthly fluxes, and the minority had irregular fluxes. The majority of double ovariotomies or oöphorectomies have been followed by a total and permanent menstrual cessation. So that, as a law, we are justified in saying that menstrual continuance, regular or irregular, after these operations, is exceptional. These exceptions are doubtless explained by:

(a) The law of habit or periodicity; (b) the presence of some ovarian stroma unintentionally allowed to remain; (c) the exceptional presence of

a third ovary, or an anomalous distribution of ovarian stroma within the folds of the broad ligaments (Beigel found accessory ovaries eight times in three hundred and fifty autopsies); (*d*) metrostaxis from chronic uterine disease, fungoid endometrium, polypi, etc.

The cases of pregnancy (Emmet, Garrigues) after double oöphorectomy prove either that a third ovary must have been present, or that ovarian stroma was left behind. Thomas has well remarked that the reason why menstrual cessation is more apt to follow a Tait's than a Battey's operation is that the ovaries are more deeply excised in the former.

All these facts warrant the following statements : Menstruation has never occurred in any female who had no ovaries. A complete extirpation of the ovaries prior to the beginning of menstruation would doubtless have prevented its original occurrence. The prime moving factor of menstruation is a preliminary ovulation. The latter function is established for months, sometimes for years, prior to menstruation. Menstruation being once established, and its law of periodicity having become fixed, it may continue for an uncertain period in the future, without any ovarian stimulus.

Most of the exceptions to the rule of menstrual cessation after oöphorectomy are explainable by the facts above mentioned. A sanguineous discharge from the uterus one or more times following oöphorectomy is usually not menstrual, but the result of some morbid uterine condition. The local irritation of an ovarian ligature applied in the operation of oöphorectomy or ovariotomy not uncommonly creates a sanguineous discharge a few days following these operations.

" Propter uterum est mulier," we used to say. We should rather say now, " propter ovarium est mulier."

THE MENOPAUSE.

" The menopause" is a term expressive of the conditions existing at the time of the menstrual cessation. This period is also called the climacteric, and the critical period of life. It really comprises all that time of life beginning with the gradual physiological menstrual irregularity, and ending with its entire cessation, after which there is a complete restoration to health. Menstruation may cease abruptly, but more often it is irregular as to time, quantity, and duration during an indefinite number of years. Usually the menopause is attended by a perfectly normal condition, general and local. Manifestations of certain nervous phenomena, mild and evanescent, are by no means uncommon, and if there should be some organic uterine disease, the general and local symptoms at this time become much more serious. Hence, very properly, it is called the critical period of life. Physiologically speaking, it is to the system at large of the elderly woman what the period of puberty is to that of the girl, or what the period of dentition is to that of the infant. It is not fraught with danger, unless there has been some serious local disease in former years.

Symptoms.—Sometimes, previous to the menstrual cessation, certain

vague nervous symptoms are felt. The most common is what is called " hot flashes," a purely nervous phenomenon, implying a congestion of the nerve-centres, from an arrest of the flow, and relieved by a vicarious hemorrhage, as epistaxis, diarrhœa, or leucorrhœa. The temper at times becomes irritable, and headaches, hysterical attacks, an unnatural fear, or melancholia may be noticed.

There are changes in the physique: the woman grows more fat and develops a growth of hair on the chin or face. Fat in the abdominal walls, simulating pregnancy, is not uncommonly observed. Symptoms of pseudocyesis are at times well pronounced. Pruritus vulvæ and eruptions on the skin are also noticed. Sexual activity where there was previous sexual frigidity is not uncommon.

DISORDERS OF THE UTERINE FUNCTION.

Menstruation, one of the special functions of the uterus, may be deranged in several ways: as, more or less absent in amenorrhœa; more or less excessive in menorrhagia; or painful in dysmenorrhœa. These are not distinct diseases of the uterus, but derangements of its functions, which are expressive of many conditions, both general and local. Pathological conditions quite different, and even dissimilar, may enter into their causation; hence, like cough and dropsy, they are but symptoms. Medical inquiry must at once be directed to the special underlying morbid conditions giving rise to them. There are great difficulties in the way of a thorough investigation in many of these cases. Fortunately, very correct inferences can be drawn as to their underlying causative factors, by the symptoms of the case and by the age and the social condition of the patient. On the other hand, at times a direct and thorough examination of the concerned organs is absolutely essential for a rational treatment. A successful and scientific treatment of these functional disorders in all their manifestations implies a thorough knowledge of gynæcology.

AMENORRHŒA.

Amenorrhœa signifies the absence of menstruation. This technical term has an absolute and a relative application. Absolute amenorrhœa means a complete absence of menstruation, and of course implies a duration of at least several months; relative amenorrhœa denotes menstruation which is delayed, scant, and comes on at prolonged intervals. Again, the term applies to those who have never menstruated, a condition called *emansio mensium*. Cessation of the function after it has once been established is called *suppressio mensium*.

Amenorrhœa is a normal condition during pregnancy and lactation; but when, from the age of fifteen to that of forty-five, there is menstrual suppression not from pregnancy or lactation but from disease, it is a true amenorrhœa. As it is based upon general and local conditions, a study of these is most satisfactory.

Etiology.—The general causes are :

(*a*) *Acute Diseases.*—The menstrual flow usually ceases during convalescence from acute diseases, on account of the general debility and anæmia ; hence its return is always an indication of a restoration to health.

(*b*) *Chronic diseases*, depressing and exhausting in their nature, cause menstrual suppression. Among these may be noticed chronic diseases of the liver, the stomach, the intestines, the kidneys, and especially the lungs. No better illustration could be afforded than the ordinary manifestation of amenorrhœa in the tubercular diseases, almost always a lung disease. In most of these chronic constitutional diseases the menstrual flow becomes more and more scant and irregular, the intervals being lengthened. Women who suffer from chronic albuminuria or general cancer become amenorrhœic. Anæmia, chlorosis, malaria, syphilis, and general struma, in which diseases the general organs lack sufficient nourishment to carry on this function, are followed by amenorrhœa. Defective hygiene causes it. In some of these conditions there may be no sanguineous menstrual discharge, but instead a profuse muco-purulent leucorrhœa. All cachexiæ are constitutional causes of amenorrhœa.

(*c*) *Psychical causes* are not uncommon. Sudden and unexpected news, fright, grief, and great anxiety are causes of this kind of menstrual disorder.

An abrupt change in the place of living, association, and climate frequently so acts. Young ladies who go from home to a boarding-school are apt to have amenorrhœa ; so are immigrants to this country. There must be some change in the nervous system through the emotions. Again, we are often consulted by the newly married, who, of course, have suspected the possibility of pregnancy. The fear of pregnancy following an illicit coitus not infrequently leads to temporary amenorrhœa. All these are conditions which very properly can be called psychical amenorrhœa. Insanity is almost always associated with amenorrhœa.

The local causes are :

(*a*) An absence or a very imperfect development of the uterus. The uterus is oftener imperfectly developed than any of the other genital organs, certainly much more frequently than the ovaries. Such a condition is found when the whole female physique is otherwise well matured. Then there is also, of course, sterility. The uterus may be fairly well developed, but it is delayed in its growth. The ovaries may be absent or ill developed, so that the sexual changes of puberty have not taken place. Such a condition is usually associated with the absence or imperfect anatomical and physiological changes of the uterus, tubes, and vagina. Cases of the presence of the ovaries, with ovulation, and an absence of the uterus, are often attended by the most aggravating nervous symptoms.

(*b*) Atresiæ, congenital or acquired, are generally causes of menstrual retention, not of menstrual suppression. There is far greater intolerance from the acquired than from the congenital causes. An imperforate hymen is the most frequent and least dangerous of these malformations.

(c) Diseases of the ovaries do not rank first in frequency and importance as local causative conditions creating amenorrhœa. Acute or chronic ovaritis comparatively rarely causes this symptom, and cystic degeneration, passing on to the tumor formations, very seldom does so. Women with large ovarian tumors become amenorrhœic towards the last, from a serious drain on the general health.

(d) Chronic metritis, in its third stage of cirrhosis or uterine atrophy, has for a prominent symptom the amenorrhœic condition. Superinvolution of the uterus, a rare condition, first described by Simpson, is at times a cause.

Acute, followed by chronic, pelvic peritonitis leads to amenorrhœa, from local structural changes induced in the ovaries and tubes.

The diagnosis of amenorrhœa is very easy, but the differentiation of the varied conditions creating this symptom may require the most skilful perception and extended experience.

The prognosis depends upon the cause. Most cases are amenable to treatment; some are utterly incurable.

Treatment.—No better example of the importance of a correct diagnosis in determining the line of treatment could be offered than a case of amenorrhœa. We must survey the body at large, to ascertain if the cause is there, and finally explore, if necessary, the pelvic organs. In this diagnostic investigation we first come to a satisfactory conclusion as to whether the amenorrhœa is physiological or pathological. If the former, no treatment is needed. If the latter, the treatment will vary according to the special cause. It must aim at the correction of the underlying morbid conditions.

Amenorrhœa from acute diseases is overcome by such means, dietetic, hygienic, and medicinal, as will restore the general health. A nutritious and well-regulated diet, fresh air, and fair exercise, with general medicinal tonics, are called for. When the special diseases are cured menstruation will in due time return. As progressive decline of the general health from chronic tubercular disease is evidenced by menstrual cessation, so reappearance of menstruation may be regarded as a favorable prognostic symptom. No special attention is to be given this pelvic symptom, but the whole treatment is directed to the pulmonary lesion. Anæmic patients need iron; always, however, after the stomach, if deranged, has been regulated, the appetite improved, and constipation overcome. Iron will fail to increase the quantity and improve the quality of the blood unless the stomach is in a fair condition to receive and assimilate it. Chlorosis calls for iron and arsenic; malaria, for quinine, quinidine, cinchonine, cinchonidine, and chinoidine, and a dry climate. A condition of syphilis needs the mercurials and the iodides.

Amenorrhœa from plethora is an indication for the use of belladonna; from obesity, a dietetic management, especially a skim-milk diet, and an abundance of physical exercise.

Rheumatic amenorrhœa calls for the salicylates. Physiological experimentation with the salicylates shows that they stimulate the menstrual as well as the hepatic secretion. Cimicifuga is a well-selected remedy for rheumatic amenorrhœa, and especially for delayed and painful menstruation. Guaiacum is also a good remedy under similar circumstances.

Strychnine is a good muscle and nerve tonic, and will assist the action of iron. Pulsatilla is indicated when the menses have been stopped by mental shock or fright.

Apiol or apiolene is one of the most safe and efficient emmenagogues. It is not contra-indicated if there is a beginning pregnancy. It may be given in capsules of five to six drops for a dose, two or three times a day, for a few days preceding the expected flow.

Aloes has been regarded as an emmenagogue. It stimulates the functions of the lower intestines and indirectly stimulates the internal genitalia. Therefore, if there is a coexisting constipation, a pill consisting of aloes, or its active principle, aloin, is a good remedy.

A great many American drugs have of late been loudly recommended for the amenorrhœic states, as caulophyllum, aletris farinosa, and polygonum hydropiperoides. At times they are useful.

The hygiene of all amenorrhœic patients needs most careful looking after. A good diet, an abundance of fresh air, out-door exercise, and cold shower-baths are never to be neglected. Sea-bathing is always useful. A change of place is often highly beneficial, particularly from inland to the sea-side. Marriage, too, is at times to be considered.

The use of the so-called direct emmenagogues, as rue, savin, and cantharides, is objectionable. The uterine function should never be forced, when the general system is struggling for existence. Very few remedies have any direct stimulating effect on the lining membrane of the uterus. Some of them, when given in large doses, cause the expulsion of the uterine contents by stimulating its muscular fibres to contract.

Hot hip- and foot-baths are generally useless, unless the function is about to appear.

Acute suppression is best treated by rest in bed, local warmth, hot pediluvia, and hot drinks.

Massage is a therapeutic means which is usually beneficial in the cure of retarded and suspended menstruation. Strong movements involving the pelvic muscles and the adductors of the thigh are useful. The uterus and the ovaries may be manipulated, as it were, through the abdominal walls. Reference is not here made to the methods of Thure Brandt.

As it is not uncommon for the menstrual function to be more or less irregular—seemingly suspended—for the first few years after its beginning, no special medicinal treatment is needed. The delay of the oncoming menstruation from fourteen to twenty years of age also calls for no treatment other than attention to hygiene in diet, dress, exercise, and baths. The uterus in these cases being imperfectly developed, time must be al-

lowed for its normal growth. Look less to the intellectual training of such girls, and more to their physical development.

Iron is the hæmatic tonic, and of course stands first. It has an emmenagogue action, increasing the blood-supply of the pelvic organs of either sex. When the stomach is ready to receive tonic doses of iron, the dried sulphate, the carbonate, the muriated tincture, or the syrup of the iodide may be chosen; these are the best. The virtues of iron may be increased by quinine and nux vomica. The following is a favorite pill with the author:

> ℞ Ferri sulphatis exsiccati, ℈ii;
>   Quininæ sulphatis, ℈ii;
>   Strychniæ sulphatis, gr. i;
>   Extracti gentianæ, q s.
> Misce et fiat in pil. xl.
> S.—One pill after each meal.

Or the pill of the carbonate of iron—Bland's pill—may be given. Wyeth's glycerole of the chloride of iron is an excellent preparation. Iron is not contra-indicated if there is obesity. Obese women may be anæmic and hydræmic.

The potassium permanganate and the binoxide of manganese are new additions to our list of emmenagogues. Experience has shown that they are very efficacious. Administered for a few days or weeks preceding menstruation, in doses of from one to two grains three times a day, they have been found to be quite serviceable. The union of the elements of these medicines is so feeble that they readily undergo decomposition. A gelatin-coated pill or a compressed tablet is the best form for their administration.

If there is atresia of the vagina or the uterus, the treatment is surgical. When the occlusion is low down, from an imperforate hymen, or in the vagina above the hymen, a free crucial incision, with thorough antiseptic drainage, is needed. When higher up, an opening in the vaginal tract should be obtained, if practicable; if not, and there is accumulated menstrual secretion, the distended tract may be perforated through the rectum, and a free opening thence maintained.

Electricity is the most reliable of all the emmenagogues, being the most direct uterine stimulant that we possess. The current may be utilized in either the faradic or the galvanic forms, the former always being tried first. Of the faradic, only the primary or the direct form should be used. The pelvic sympathetic may be stimulated by general faradization or central galvanization. The primary faradic current is best applied as follows: the negative pole is placed within the uterus, by an appropriate intra-uterine electrode, while the positive pole is applied externally to the abdomen or the sacrum. A séance of about fifteen minutes may be held every third day. Simpson's intra-uterine galvanic pessary, as modified by Thomas, need not be used, being purely a local uterine irritant. The galvanic current, in

the strength of from five to ten milliampères, may be used if the faradic fails.

The local use of electricity is especially adapted for stubborn, long-continued cases which have resisted the hygienic and medicinal treatment, —for instance, those cases in which the uterus is quite small and ill developed or has been atrophied from superinvolution or chronic metritis, or in which the internal genitalia are markedly dormant and atonic. The good results at times attained have been very surprising. Personally, I have seen fertility follow this intra-uterine treatment when given for amenorrhœa and sterility.

VICARIOUS MENSTRUATION.

Vicarious menstruation is a condition closely allied to amenorrhœa. It means a condition of the female system in which there is a regularly recurring discharge of blood from other parts of the body besides the uterus. This vicarious sanguineous flow comes from the nose, the bronchial tubes, the stomach, the intestines, or the rectum, generally from a mucous surface; but it may take place from the skin or at the site of a wound or a scar, when the structures are favorable for its exit. In most cases there is also absolute amenorrhœa. Its explanation is easy when we consider the physiological phenomena in the nervous and vascular systems which attend menstruation. As already stated, menstruation is not by any means a purely local pelvic matter, but is always general in its *modus operandi*.

The treatment applicable for vicarious menstruation is that which is adapted for amenorrhœa. Few, if any, means should be made use of to stop the vicarious flow, unless possibly its continuance might be hurtful. Measures calculated to restore the normal direction of the sanguineous discharge have been dwelt upon in discussing the management of amenorrhœa.

MENORRHAGIA.

Menorrhagia is an excessive menstrual flow, being expressive of a condition the opposite of amenorrhœa. There are menorrhagic conditions as to time, quantity, and duration, as well as an absolute menorrhagia. Thus, if menstruation appears too often, is excessive in quantity, or continues too long, the condition is menorrhagic.

" Menorrhagia" is a term often confounded with " metrorrhagia," which means non-menstrual uterine hemorrhage.

As the amount, the duration, and even the frequency of menstruation vary greatly within physiological limits, it becomes difficult at times to say when normal menstruation ceases and menorrhagia begins.

Etiology.—Both menorrhagia and metrorrhagia are generally dependent upon a common cause, and both usually exist at the same time. They depend upon many and widely different causes, both constitutional and local.

The constitutional or general causes are plethora, anæmia and chlorosis, debility from excessive lactation, hæmophilia, purpura, scorbutus, chronic

valvular diseases of the heart, chronic pulmonary diseases, as pneumonia and emphysema, hepatic disease, as chronic cirrhosis, chronic splenic and renal diseases, chronic constipation and abdominal tumors, and psychical influences.

The local pelvic causes are ovarian and peri-uterine congestions and inflammations, tubal inflammatory diseases, hæmatosalpinx, uterine congestion, chronic metritis (first and second stages), subinvolution of the uterus, chronic endometritis, with fungoid granulations, cervical lacerations, uterine displacements, especially retroversion and retroflexion, uterine fibroids and polypi, cancer of the uterus, and retention of the products of conception. Uterine and ovarian congestion followed by menorrhagia may be provoked by excessive coitus. Menorrhagia occasionally accompanies plethora. Stout, obese women generally have scant menstruation.

Thus it will be seen that any cause which essentially alters the quantity or deranges the quality of the blood—plethora, anæmia, chlorosis, or hæmophilia—may lead to excessive menstruation. Women who have had an excessive drain of milk during lactation are apt to have menorrhagia.

Any causes which impede the normal return of the venous blood, as valvular diseases of the heart, chronic pneumonia or emphysema, hepatic, splenic, and renal diseases, abdominal tumors, or loaded bowels, are almost always attended by prolonged and profuse menstruation. Psychical causes also act in the same way. Fright, fear, and excessive mental or emotional disturbances act as potently as do morbid physical conditions.

One of the most common causes is the presence of fungosities within the uterine cavity, either from chronic endometritis or from a retention of some of the products of conception. The profuseness of a menorrhagic attack is by no means in proportion to the size of an intra-uterine growth ; a small polypus and fungosities may act as potently as large tumors.

Malignant disease of the uterus is almost invariably followed by menorrhagia and metrorrhagia. These are among its first symptoms, and they diminish only late in its progress. Many, if not most, women become so accustomed to lose blood per vaginam that any beginning hemorrhage may be neglected. Many women labor under the impression that the change of life must be attended by an excessive menstrual flow. The cause of any excessive menstruation should always be sought, as this is invariably indicative of some disease.

Laceration of the cervix uteri is a very common cause of cervical erosion, eversion, and a general endometritis, with fungoid granulations, hence menorrhagia. Parametritis and perimetritis have metrorrhagia as a common symptom. In all uterine displacements and flexions the uterus is the seat of more or less hyperæmia, from an impeded venous circulation. Of the various displacements retroversion is most commonly so attended.

Subinvolution of the uterus, in which the organ is enlarged, softened, imperfectly contracted, and congested, has menorrhagia for a symptom. Subinvolution is often the first stage of chronic metritis. The second

stage of chronic metritis, or chronic hyperplasia, is also attended by excessive menstruation, and the menorrhagia does not cease until the third stage, or cirrhosis of the uterus, has commenced.

Treatment.—The treatment of menorrhagia is that appropriate for the attack proper and for the menstrual interval.

For the attack the first consideration is rest in the recumbent posture. By this position of the body the pelvic organs, whether the seat of active or of passive hyperæmia, are, through the influence of gravity, relieved to no inconsiderable extent of an increased blood-supply. All tight clothing should be removed. The bed should be hard and cool.

The food should be light and non-stimulating. It is always prudent to keep the bowels open and the rectum and colon unloaded, and to favor the return of the portal venous circulation, which is intimately connected with the pelvic. An occasional so-called cholagogue, followed by a saline, not too active, may be advantageously employed. Chronic constipation is always to be overcome by mild doses of salines, and by such agents as small doses of podophyllin with nux vomica.

Which are the best medicinal hæmostatics will depend entirely upon the provoking causes. Should the fault lie in the heart's action or in a retarded venous circulation, one of the best medicines is digitalis. A good tincture made from the English leaves or a pure infusion is the best form. Digitalis has not a wide range of application, but in certain conditions is a fairly reliable hæmostatic agent. Temporarily beneficial in uterine hemorrhages resultant on cardiac disease (mitral insufficiency), it may prove curative in other cases. An atonic condition of the circulation, a weak heart, with slow or rapid action, and low arterial tension—conditions which aggravate, if they do not produce, excessive hyperæmia of the uterus, and hemorrhage—may be combated by digitalis.

Morbid psychical conditions are best relieved by the bromides. Menorrhagia from excessive coitus also calls for bromides.

Faulty conditions of the blood, from anæmia, chlorosis, excessive lactation, hæmophilia, or defective hygiene, are best improved by a good hygiene and weaning of the child, and by the internal administration of iron and other tonics. As a rule, iron is contra-indicated during menstruation, especially if the flow is excessive; but to this rule, as to all others, there are exceptions. Iron, in the form of the muriated tincture, proves to be an excellent means for checking excessive menstruation dependent on marked anæmia, hydræmia, and hæmophilia. In most cases iron is to be utilized only during the menstrual interval.

Menorrhagia from plethora calls for a restricted diet and the use of the salines and the bromides.

Arsenic is a most valuable hæmostatic in the menorrhagic conditions of young girls, as well as of women nearing the menopause. Menstruation which at either time of life comes on too frequently, continues too long, or is too profuse, being purely functional, is best met by Fowler's solution in

doses of from three to five drops every few hours to two or three times a day. It seems to be indicated when iron is contra-indicated, and may be given during the time of the flow as well as during the interval.

We have seen good results follow the use of gallic acid internally, but do not place much dependence upon it.

Ergot stands at the head of the list of all medicines as a uterine hæmostatic, because of its well-proved physiological effect in stimulating contractions of the involuntary unstriped muscular fibres, wherever found. It is singularly well adapted to conditions of the uterus in which there are well-developed but relaxed muscular fibres with dilated and engorged blood-vessels. Hence such pathological states of the uterus as chronic hyperæmia of the active or passive kind, chronic metritis in its first stage, and sub-involution are controlled best by ergot. These conditions, for manifest reasons, are less marked in the nullipara than in the multipara. The more soft, flabby, relaxed, and engorged with blood the uterus is, the more pronounced will be the good effects of ergot.

Quinine is, of course, the remedy when the disease is of malarial origin. The efficacy of ergot is at times enhanced by combining it with quinine and nux vomica.

One of the most useful of all remedies given internally is hamamelis, in the form of the fluid extract. It is an American remedy, and has been utilized for hemorrhages from all parts of the body and for varicose veins. Hamamelis does not seem to be equally efficient for all kinds of uterine hemorrhage. For the sudden outburst or for active and profuse hemorrhage it is inferior to ergot, but for a slow, long-continued flux, when the blood is dark and venous and the hemorrhage is passive in character, it is the remedy *par excellence.* These are conditions always present in flabby, enlarged, subinvoluted uteri after delivery at term and after abortions, also in some forms of chronic endometritis, before or following the removal of fungosities, and in chronic retroversion, some fibroids, etc. I have also found hamamelis to exert a favorable influence upon urinary hemorrhages in several cases of papilloma of the female bladder. The fluid extracts of secale cornutum and of hamamelis make an efficacious combination.

Viburnum prunifolium has been successfully used, especially when the menorrhagia has been coupled with dysmenorrhœa. Cannabis indica is highly recommended by Churchill and Thomas.

Hydrastis canadensis has been favorably reported upon by various European authorities. By them it is regarded as a vaso-constrictor in congested states of relaxed mucous membranes. For uterine hemorrhages due to metritis, endometritis, myomata, or incomplete involution it has been found to be invaluable. It combines well with the fluid extract of ergot. Hydrastinin appears to be the best form for the administration of hydrastis. A ten-per-cent. solution of hydrastinin may be given hypodermically, but an excellent form for its use is a preparation made by Lloyd Brothers, of Cincinnati, called " Lloyd's Specific Medication." This pos-

sesses all the active ingredients of the drug, without any of the extraneous materials found in fluid extracts.

The action of all medicinal agents should be supplemented in bad cases by local applications. Cloths wrung out of cold water, or a rubber bag filled with ice-water, may be applied to the hypogastric region. Quite cold water may be injected into the rectum. Heat is also a good remedy, better than cold. This is admirably illustrated in the treatment of post-partum puerperal hemorrhage. A large quantity of very hot water, from 125° to 135° F., may be injected into the vagina in bad cases. Should the patient become profoundly anæmic and swoon from loss of blood, an excellent way to revive her is to inject a pint or more of hot salt water into the rectum, thereby directly stopping the flow, and sustaining her by the absorption of the saline fluid.

The best non-surgical local means is the use of the vaginal tampon. When the hemorrhage is severe, and when on account of distance it is not practicable to visit the patient often, the whole vagina and the cervical canal may be tamponed with dry absorbent cotton, after the use of hot-water vaginal irrigation. To add to the efficiency of these tampons, those in contact with the cervix may be medicated with glycerite of alum. These tampons are allowed to remain from twelve to twenty-four hours and are then removed; the vagina is then again irrigated with hot water, and is again tamponed, if necessary. Internal medication suited to the case is continued. If the flow is excessive and life is endangered, any oozing should be detected by frequent inspections. Should the vaginal packing fail, the uterine cavity is to be packed with tampons of appropriate size, after dilatation with the metallic forceps. Dilatation, curettage, and uterine packing with iodoform gauze, applied with a suitable intra-uterine forceps, are not to be neglected in many of these cases of chronic hemorrhagic endometritis.

The following principles are ever to be borne in mind in the treatment of menorrhagia and metrorrhagia. In all cases, if any local interference is needed, see that the uterine canal is kept open; obtain and maintain a patulous uterine canal. This of itself tends to arrest the bleeding. Then remove all foreign bodies, products of conception, fungoid granulations, intra-uterine polypoids, and fibroid tumors. During the intervals, the judicious and thorough use of the intra-uterine curette is one of the best means of promptly and safely curing many of these cases. Its use should precede any intra-uterine medication. The best local uterine medicaments are Churchill's tincture of iodine, iodized phenol, and iodo-tannin. These medicaments may be applied with a cotton-wrapped probe or with the intra-uterine syringe.

Intra-uterine injections are safe if the cervical canal is patulous, if the fluid is warm, if no air is injected, and if no force is employed.

Puncture of the cervix to abstract blood, followed by applications of tampons of boro-glyceride, does good in some cases of chronic congestion of the uterus.

Removal of the uterine appendages should be adopted only as a last resort in any case. Cancer of the uterus calls for hysterectomy, partial or complete.

Malpositions of the uterus which give rise to menorrhagia are treated by rectification of the position of the organ, by tampons, by electricity, and by pessaries. Any coexisting chronic endometritis is to be combated by dilatation, curettage, and packing. Lacerations of the cervix, and their sequelæ, call for curettage and trachelorrhaphy.

Local galvanization of the uterus is a therapeutic agent worthy of the highest consideration in bad cases of uterine hemorrhage dependent upon uterine fibroids and chronic affections of the endometrium. It is often best to use the curette a week before commencing the use of the galvanization. The positive pole, a suitable sterilized electrode of iridium or platinum, should always be applied within the uterus. The effect of the positive pole is to coagulate the albuminous particles in its immediate vicinity, and thereby to produce a hardness of these tissues. This characteristic action varies with the strength of the current, from slight congealing and hardening of the tissues, to general coagulation and solidification for a considerable space around. Positive galvanization is, then, a most potent uterine hæmostatic.

Chronic endometritis with hemorrhagic vegetations is more amenable to positive galvanization than are uterine fibroids. Chronic metritis, associated as it usually is with chronic endometritis, is also greatly benefited by local galvanization of the uterus, the positive pole being utilized in the first and second stages, and the negative pole in the third stage. The absorption of the hypertrophied tissue is stimulated by the inter-polar effect, while the polar effect is localized on the diseased endometrium and its immediate surroundings. The séances may be for fifteen minutes once in three days, the strength of the current being from ten to fifty milliampères.

DYSMENORRHŒA.

"Dysmenorrhœa" means difficult or obstructed menstruation, and refers to pain preceding, accompanying, or following the menstrual discharge.

A certain sense of pelvic fulness and discomfort doubtless almost always attends the menstrual function, but, as normal menstruation is not attended with any special pain, any menstrual period which is painful is called one with dysmenorrhœa. All chronic inflammatory pelvic diseases attended with pain at the menstrual interval have more pain at the time of the flow, but this is not dysmenorrhœa; nor are those cases in which inter-menstrual pain comes on with marked regularity about the middle of the inter-menstrual period instances of dysmenorrhœa.

Dysmenorrhœa is one of the most common of the various menstrual derangements, and manifests itself by pain, which varies greatly as to frequency, duration, time, and severity. As it simulates other pelvic affections, they are sometimes taken for it, and *vice versa*.

Dysmenorrhœa may properly be divided into the following varieties:

the neuralgic, the congestive or inflammatory, the obstructive, and the membranous. All these forms have symptoms more or less in common, but, as they are different in their essential morbid conditions, it becomes necessary for the purpose of treatment to determine each variety presenting itself. The dividing line between the varieties is not always well marked. Normal menstruation depends almost as much on a good condition of the constitution at large as on a healthy state of the intra-pelvic organs. Hence dysmenorrhœa may be constitutional or local in its origin. The variety known as ovarian differs from the others more in location than in kind. Spasmodic dysmenorrhœa is a term applied to the neuralgic form in which there is a spasm of the circular fibres about the os internum.

Neuralgic Dysmenorrhœa.

Neuralgic dysmenorrhœa is a variety in which no special disease of the uterus or the appendages may be detected. Ordinarily, on the most careful physical exploration, no alteration in size, shape, position, consistency, or vascularity of the pelvic organs or structures will be noticed; or, if any is observed in any case, the morbid condition is quite uncertain as to location, quantity, or variety, no two cases being alike. Again, a seeming causative local disease may be cured, but the dysmenorrhœa continues, showing us that the pathological entity, as appreciated by our senses, is not pathognomonic. The most severe types of the malady are seen in nulliparæ in whom there is no structural lesion of the uterus. There is a neuralgic or hyperæsthetic, it may be at times a congested, condition of the corporeal uterine membrane. The insertion of the uterine sound or an electrode to the os internum uteri and along the mucosa elicits pain identical in kind and degree with the dysmenorrhœic pain. A slight discharge of blood sometimes follows this method of exploration, even when carefully done. Then there must be a congestion of the endometrium; but the pain produced cannot be the result of this condition alone, being out of all proportion to it. The sentient nerves of the endometrium are in a state of hyperæsthesia —a neuralgia. This hyperæsthesia is mostly at the os internum. It is not improbable that a fissured state of the neighboring endometrium, inducing a spasm, may at times excite a contraction such as we see in anal fissures. In such a state menstrual pain will be excited by the influx of blood into the tissues. The greater the tension and the rigidity of these tissues, other things being equal, the greater the pain; and this is probably one explanation of the greater relative frequency of dysmenorrhœa in the unmarried and the nulliparous. A similar unyielding character of tissue is present in some cases of chronic metritis. With it there are undue vascular tension and a compression of the end nerves, which are always irritable. When the flow is well established, the swelling subsides, and tension is relieved.

Causes.—In no variety of dysmenorrhœa is it more important to determine the constitutional condition. There is present a local neurotic state

provoked to the excitation of pain by the stimulus of the physiological pelvic congestion incident to the oncoming menstruation. This pain is increased by the presence of the hemorrhagic flow within the uterine cavity. The local neurosis, an expression of the nervous system in which there is an exalted sensibility to pain, shows itself by general hysterical phenomena, spinal irritation, neurasthenia, and local and general neuralgiæ. Pain, like age, is relative. The causes may be the same, but no two patients suffer alike. Anæmic and chlorotic states of the blood always predispose to neuralgic dysmenorrhœa.

Rheumatism and gout are direct exciting causes. The rheumatic dysmenorrhœa much resembles the neuralgic. All habits of body conducive to indolence, want of proper physical exercise, and faulty methods of dress, by enervating the nervous system, indirectly lead to dysmenorrhœa. Hence the disease is relatively more common in the upper classes. Excessive venery and masturbation favor its development. General ill health retards any easy and physiological disintegration of the intra-uterine membrane.

These diseases are too often the penalty of a poor inheritance, a defective hygiene, a forced education, and the false stimulus of our modern and artificial life.

Symptoms.—Every possible kind of pain may be experienced as to time, duration, severity, and location. Some cases are so pronounced that the pain is felt at the very inception of the menstrual function, and continues with an increasing force for years after, until it becomes very severe, most dreaded, spasmodic, and agonizing. In this neurotic variety the pain is intermittent, remittent, or continuous. Again, it may start after years of painless menstrual life, for instance, commencing after marriage. Severe types of the disease are often associated with reflex headaches, sympathetic nausea and vomiting, or neuralgic pains elsewhere, at the menstrual times, seemingly supplementing or superseding the localized uterine pain. Other organs of the pelvis, as the bladder and rectum, become affected by sympathy. The breasts become tumid and tender. Sometimes there are periods of uncertain length during which there is little or no pain, after which there may be a relapse. Such periods are noticeable after physical or mental recreation, a change of habits, and during and after a time of travelling, with its manifold divertisements.

Severe dysmenorrhœal attacks are always attended with and followed by much prostration, so that weeks may be needed for a full recuperation.

The pain is located in the uterine or ovarian regions, but oftentimes is felt also in other parts of the body. It comes on soon after the commencement of the flow, is most severe during the first day, becomes less during the second day, and least towards the last. The discharge may be scanty or profuse, or consist of clots. The severity of the pain seems to be in inverse proportion to the quantity of the flow. The diminution of pain following the flow is not so manifest in the neuralgic as in the congestive variety.

The diagnosis is made by an exclusion of the other varieties, after a

physical exploration and after a careful analysis of the local and general symptoms. Neuralgic dysmenorrhœa is by far the most frequent variety. Commencing early in life, at or soon after puberty, or in early married life, it is found oftenest in those who are subject to the various neurotic diseases.

As stated, although physical exploration quite generally fails to find any morbid conditions of the uterus and its surroundings, one of the most common pathological lesions in this variety is anteflexion or some congenital defect of the uterus. That the flexion itself does not cause the painful menstruation must be apparent. Probably the dysmenorrhœa exists when there is anteflexion because the uterus is ill developed and neurotic.

Congestive or Inflammatory Dysmenorrhœa.

Pathology.—This variety of the disease has a more distinct pathology. Any cause, constitutional or local, which promotes or perpetuates active or passive hyperæmia of the uterus may lead to it. The inflammatory types of the affection are usually of a chronic form, and may not only implicate the uterine tissues proper, but likewise involve the parametric structures,— tubal, ovarian, and peritoneal.

Symptomatology.—Pain is usually present for days prior to menstruation, increasing each day as that function approaches, and mitigating more or less after its appearance. The woman feels more at ease after the flow is established, contrary to the clinical phenomenon of the neurotic variety.

The diagnosis is based on the symptomatology and on the signs which are elicited by a physical exploration.

Ovarian dysmenorrhœa implies ovarian congestion or inflammation. Some developmental defect of these organs predisposing to neuralgia, or a varicocele of the pampiniform plexus of the organ, is present. Scanzoni suggested that the ovarian pain in dysmenorrhœa might be due to the maturing of a Graafian vesicle lying deep in the ovarian stroma.

Obstructive Dysmenorrhœa.

The essential condition of this variety of dysmenorrhœa is a retention of the menstrual secretion. The inference that painful menstruation is mechanical in its origin has seemed most natural because of its directness, simplicity, and plausibility. This theory, popularized by Macintosh, of England, in 1832, and subsequently by Simpson and Marion Sims, has too often swayed professional opinion. In the light of modern gynæcology, and with the present thoroughness of physical pelvic exploration, it cannot be doubted that in a certain proportion of cases obstructions of the uterine canal do exist, and that these may serve to create pain in menstruation.

Abnormities of the uterine cervix, congenital and acquired, with stenosis, are by no means uncommon. Of the congenital form, there is especially the elongated and conoid infra-vaginal cervix, with the pin-hole os; of the acquired, that arising from chronic inflammation of any of the tissues, and

especially that resulting from the vicious use of certain caustics. This stenosis is sometimes very great, and there may be almost complete occlusion. Flexions of the uterus can create obstruction only when they are sharp and the curvature is present to the second degree. Dysmenorrhœa associated with anteflexion does not come from any obstruction of the canal.

Some standard as to the average size of the cervical canal is usually accepted. Tilt has ventured to say, "When the cervical canal will not allow an ordinary sound to pass through it easily, the cervix should be dilated or divided." Sims denied that the easy passage of a medium-sized sound into the cavity is proof that there is no need of surgical interference.

But the size of the canal, like the quantity of the menstrual flux, is relative and not absolute. A much better evidence of obstruction is obtained when immediately following the withdrawal of a small-sized sound pent-up secretion or menstrual blood escapes.

Besides, there are narrowings and tortuosities of the uterine canal from the presence of intra-uterine and interstitial fibroids. Membranous dysmenorrhœa is clearly due to impeded menstrual flux, for as soon as the false membrane is expelled pain is relieved and the uterus is at rest. Under all these circumstances the seat and kind of pain, intermittent, expulsive, and resembling the throes of labor, and the duration and the intermission of the flow, may be more or less characteristic. Such pains are called expulsive, for the uterus is struggling to overcome a resistance and to expel its contents.

It is not difficult to understand how, in a certain sense, all the varieties of dysmenorrhœa (but not all cases) may at times be attended with a certain narrowing of the uterine canal: the neuralgic, by a spasm of the circular fibres, especially at the internal sphincter of the cervix; the congestive, by a swollen endometrium, clots of blood, and broken-down mucous membrane; and the membranous, by its false membrane. It is clearly understood how long and oft-repeated attacks of pain may lead to structural changes. The neuralgic may become congestive, and conversely. To regard all dysmenorrhœa as practically obstructive seems not only erroneous in theory, but pernicious in practice, and for the following reasons.

There is want of conformity between the seeming causative lesion or abnormity and the symptoms. Not only, as stated, may there be dysmenorrhœa when no abnormal conditions of the uterus as to size, shape, position, or condition can be detected, but, on the other hand, well-defined abnormities of the uterus, as the pin-hole os, the elongated cervix, the contracted canal, the flattened and ill-developed uterine body, and flexions, may be present and there may be no dysmenorrhœa.

Stenosis of the os externum, marked in kind and degree, resulting from chronic inflammation or the unwise use of caustics, and well-defined acquired flexion, are not always attended by menstrual pains. Instances are not wanting of uteri with patulous canals and much attending dysmenorrhœa.

Allowing four days for the menstrual period, and two ounces of fluid

for each day,—an amount in excess of most cases,—some forty drops are emitted each hour, or about two-thirds of a drop each minute, a quantity which would easily pass through almost any cervical canal. Therefore we are forced to believe not only that dysmenorrhœa is in most cases not obstructive, but also that any obstruction rarely exists.

Associated with organic diseases or not, sometimes developed but more often aggravated by them, clinical evidence points to the conclusion that the neurotic feature is the only one in many cases, and that it is manifested to a greater or less extent in all.

Membranous Dysmenorrhœa.

Pathology.—This variety, the least common, consists in a casting off, in shreds or in complete sections, of the superficial layer of the uterine mucous membranes. The cast-off film resembles a product of conception, and its expulsion has been mistaken for an early abortion. When complete, it represents the triangular cavity of the corpus uteri. It is soft, comparatively thick, with many perforations, the sites of the utricular follicles. It is the uterine lining membrane, hypertrophied in all its structures, as in pregnancy, hence called the "menstrual decidua." But the absence of the chorionic villi and the decidual cells proves that it is not a product of pregnancy.

FIG. 1.

Dysmenorrhœal membrane (Coste).

Two views, in the main, are held: that its production is the result of some ovarian disease (Olshausen and Tilt), and that it is a desquamation or exfoliation of the uterine mucous membrane (Raciborski and Simpson). Klob, whose opinions are widely accepted, says that it is an exudation from endometritis. Braun also accepts this view.

Symptoms.—The dysmenorrhœic pain begins at the inception of the flow, and increases in severity until the sac is completely expelled. The pains resemble those of early abortion or the first stage of parturition. The menstrual flux increases in quantity until the expulsion occurs. The pain and the flow cease together.

Diagnosis.—As it may be mistaken for the products of an early abortion or a mass of blood-clots, polyps, or diphtheritic exudations spontaneously expelled, a careful physical and microscopical examination may be required: this once made, no doubt will remain.

Prognosis for all Varieties.—The prognosis of dysmenorrhœa is for the most part favorable. The longer the duration, however, other things being equal, the more difficult it is to effect a cure. The difference in the curability depends largely on the fact that the impressionability of patients to pain becomes more and more marked. Nothing so much increases the susceptibility of the nervous system to pain as the almost constant use of opiates in some form by many of these patients. The abuse of opium and of the whole list of narcotics and stimulants under these circumstances is very great. They induce a condition of the nervous system—a subjective state of pain, exaggerating the patient's sufferings and demanding relief at any cost—more difficult to overcome than the original disease. The neuralgic variety of the malady is more amenable to treatment than formerly, and the great majority of cases are entirely curable. The congestive form is easily relieved, the obstructive is controllable, but the membranous is the most stubborn to combat.

Treatment of Dysmenorrhœa.—In this disease there is a practical exemplification of the fact that the underlying essential of all treatment is diagnosis. Having determined the variety of the painful menstruation, and especially the local pelvic condition of the uterus, the ovaries, the tubes, and the parametric tissues, in all cases in which any local examination is justifiable, we are prepared to form a rational plan of management. The treatment may be divided into that which is appropriate for the time of the flow, to relieve pain, and that which is suitable for the menstrual interval, to prevent pain. The latter, then, in a curative sense is more important than the former. Almost all cases of dysmenorrhœa, irrespective of kind, call for some constitutional treatment. A bad constitutional condition favors the disease, and in all long-continued cases the general health is undermined.

Let us now consider first the constitutional treatment appropriate for the menstrual times, in general.

For the attack of pain, of course no local treatment is needed except what the patient employs herself. A great many remedies have been employed to mitigate the menstrual pain, but reference is here made only to such as the author's experience has found useful.

The tincture of pulsatilla is an excellent remedy in a few cases. Unfortunately, it fails more often than it succeeds. It is indicated only in the neurotic types of the disease, especially in young women, but is not contraindicated in any form. It is best given in ten-drop doses three times a day for at least three days preceding the inception of any painful period, and should be continued in similar doses, given more frequently at the time for pain, if pain is then present.

The tincture of cimicifuga may be administered in a similar manner. It is indicated for the neuralgic form of the disease. Unlike pulsatilla, it is generally efficacious. Experience has taught us its usefulness in chronic rheumatism, and it is admirably adapted for the rheumatic types of this

disease. In many cases it may be given three times a day during the whole interval, and more frequently at the menstrual time. The salicylates influence the menstrual flow, making it more free and less painful, especially if it is of a rheumatic type. In cases distinctly rheumatic the salicylates may be given three times a day during the menstrual interval, and every two or three hours at the time of the flow. Guaiacum in the ammoniated tincture seems especially adapted for the rheumatic forms. Many years since, a preparation called Fenner's tincture—gum guaiacum and mercuric bichloride—was in common use for dysmenorrhœa, but, like many other remedies in medical practice, had then an uncalled-for application.

A combination of mercuric bichloride and potassium iodide, administered for a long season, is at times very efficacious. Its benefits have not been due to the relief of any syphilitic complications, or to the melting down of any parametric inflammatory infiltrations, the only lesion being a chronic endometritis, with spasmodic dysmenorrhœa.

Viburnum prunifolium is another remedy now much prescribed, and for some cases has a well-deserved reputation. The following is the author's formula for its use :

> ℞ Ext. viburni prunifolii fluidi, ℨj ;
> Tinc. cardamomi comp., ℨss ;
> Syrupi simplicis, ℨss.—M.
> Sig.—One teaspoonful every two or three hours.

Caulophyllum and viburnum opulus have a similar use. All these last-mentioned remedies act best when the flow is not scanty. The bromides of potassium and sodium seem best indicated in the ovarian types of dysmenorrhœa. Gelsemium is the remedy for cases with rigidity of the cervix and for the spasmodic forms of the disease. Five drops in water may be given each hour.

Cannabis indica is a nerve-stimulant, an anodyne, and an antispasmodic. It acts somewhat like ergot, but more promptly and energetically. It would seem to be indicated in cases where the ovarian neuralgic condition is present. It is certainly to be preferred to opium.

Nitroglycerin, in doses of one drop of a one-per-cent. solution, may be prescribed in cases accompanied with vaso-motor spasm and characterized by pallor and coldness of the skin. Antipyrin would appear to be indicated in a class of cases the opposite of those calling for nitroglycerin, when there is vaso-motor dilatation and flushing of the skin, with an increased temperature.

Apiol or apioline, in capsules of three minims each, every two to three hours, when severe pains precede the appearance of the flow, and in the amenorrhœic forms of dysmenorrhœa, is useful.

The medicine most frequently given is opium, in some of its forms. No remedy is more abused ; none should be prescribed less frequently. More harm than good has been done by its administration. It is the easiest

matter to create a fondness for its use and favor a physical dependence upon its continuance. Only an extreme necessity would justify its use by the mouth or hypodermically. All its good effects may be obtained and some of its ill effects obviated by giving it in the form of a suppository composed of the aqueous extract of opium combined with the extract of belladonna, only as needed.

All cases of dysmenorrhœa are relieved by rest in a recumbent posture, by hot applications to the lower abdomen, and by the use of the hot vaginal douche. The extremities should be kept warm.

Treatment during the Interval.—This is subdivided into the constitutional and the local.

The constitutional treatment implies first the correction of all defective hygienic conditions. Every dysmenorrhœic patient should observe the greatest care in diet, bathing, dress, exercise, and mental exertion. The bowels should be evacuated daily, while systematic cholagogue and saline purgation is called for in the congestive and inflammatory varieties.

Marriage is at times to be considered favorably. Many women with dysmenorrhœa are sterile ; but if fertility follows marriage, parturition and lactation may cure the disease. Marriage is often beneficial in the neurotic types of the disease, but is contra-indicated in the congestive, obstructive, and membranous varieties.

Many, if not most, patients with dysmenorrhœa are more or less anæmic, and a scanty menstrual flow is more common than one which is profuse. Hence iron in some form is a very good remedy to begin with. The best preparations are the dried sulphate, the pill of the carbonate, and the muriated tincture. The system at large may be fortified by other tonic remedies, as quinine, strychnine, arsenic, phosphorus, and cod-liver oil, given alone or in combination with iron. Arsenic is called for if the flow is profuse, and mercuric bichloride, with tincture of cinchona, if there is chronic endometritis. The general nutrition may be improved by cod-liver oil, the malt extracts, and a full diet. Arsenic and mercuric bichloride, in minute doses long continued, are the best remedies for the membranous form of the disease.

All excitements, both general and local, as well as undue sexual intercourse, dancing, and the prolonged use of the sewing-machine, are to be avoided.

All morbid conditions of the uterus and the parts surrounding it are to be remedied as far as possible during the interval by proper medical and surgical treatment. One of the most common of these morbid conditions is chronic endometritis. When this is present, thorough uterine curettage, after cervical dilatation, is the first thing needed. Dilatation by expanding forceps after the Ellinger pattern or some of its modifications (as Goodell's or Palmer's) has been practised to a considerable extent, and no doubt many cures have resulted. The method is not employed so frequently as formerly. On theoretical grounds, it would seem to be

indicated in cases where there is a highly sensitive, if not a fissured, state of the endometrium about the os internum. It benefits these cases in the same way that a thorough stretching of the sphincter ani relieves cases of fissures of the anus.

A forcible dilatation repeatedly made with the metal instrument is to be regarded as a surgical operation to be conducted with thorough antiseptic precautions, always followed by a few days' rest in bed. Curettage may be done at the same time. Performed with care and special precautions, it is not a dangerous procedure, and almost always does good, at least for some months. Many relapses occur, however.

Theoretically, electricity appears to be strongly indicated in most cases of dysmenorrhœa, and experience has substantiated this view. It is especially indicated in the neuralgic form of the disease, but is not contra-indicated in any variety. General and possibly local faradization (extra-pelvic and intra-pelvic) often do good. The secondary faradic current (that of tension) is to be preferred to the primary, and might properly be utilized first. But the galvanic current is far more potent for good. It should always be given with an intra-uterine metallic electrode, a method which implies that the best antiseptic precautions are to be called into requisition. The vagina should be washed out with an injection of hot mercuric bichloride solution (one to two-thousand), and the intra-uterine electrode, first cleansed and then dipped in a stronger solution of the bichloride, is applied to the fundus uteri, while the other electrode is placed over the abdominal wall. The polar effect should always be considered. The positive pole is used if the uterine canal is patulous and the menstrual flow is too free or too long continued. It is more useful in controlling pain, diminishing congestion, and lessening irritation than is the faradic. Hence, as a rule, it is to be chosen. When, however, the menstrual flow is very scanty, the uterus small, and its canal contracted, the negative pole applied topically will do more good. The séance should continue for fifteen minutes at least once a week during the menstrual interval, and the strength of the current should be from twenty to forty milliampères. Very few cases will resist this treatment. If it is given with antiseptic precautions and followed by necessary rest, bad results need never be expected.

The congestive form may be treated in the same manner, after purgation, rest, and local depletion, if the neurotic element also enters as a factor into the local condition.

Believing that stenosis exists much oftener at the external than at the internal os uteri, it can readily be understood why sterility is far more frequent and persistent than dysmenorrhœa. It is easier for the menstrual discharge to escape than it is for the spermatic fluid to effect an entrance. It is well-nigh impossible for sterility to continue over a period of five years of married life without causing local disease,—catarrh, parenchymatous congestion, displacements of the uterus, and, finally, sympathetic disorders of the ovaries. So vascular are these organs that they cannot be subjected

for years to the hurtful influences of oft-repeated, as well as the periodical, influxes of blood, without a rest, and yet suffer no disturbances in circulation. From this cause, and perhaps others less active, the quantity of the glandular secretion, as well as that of the menstrual discharge, is increased, and any existing stenosis is made relatively greater. The only rational treatment is to strike at the original cause, and to remove the first link in the chain of the disease. Open up the stenosed canal. Painful menstruation is thereby mitigated, and the chances for fertility are increased. Galvanization is an admirable remedy under these circumstances, the negative pole, for its local dilating effect, being chosen.

Treatment of Membranous Dysmenorrhœa.—This variety is the most intractable of all, dependent, as it generally is, on some morbid condition of the corporeal endometrium. It is best treated by a certain amount of cervical dilatation, followed by a thorough curettage of the endometrium with a sharp instrument and packing with iodoform gauze. This operation is done about one week preceding the expected menstrual period, and may be repeated about one week after its close. Intra-uterine galvanization may follow in another week. The intra-uterine electrode should be the negative pole, because of its dilating effect. I am disposed to attribute greater therapeutic power in these cases to careful, thorough galvanization (from ten to twenty-five milliampères) than to very frequent curettage and intra-uterine medication.

<center>STERILITY.</center>

This is another functional disorder of the uterus, and implies an inability for impregnation during normal reproductive life.

Sterility is either relative or absolute. In the former condition there is diminished procreative power, in the latter procreation is impossible.

Sterility is sometimes congenital, resulting from faulty development. It is said to be acquired when it arises from disease after an uncertain period of fertility.

Matthews Duncan says that one marriage in ten in Great Britain is sterile. Probably the percentage is larger in the United States. Many women are childless in early married life from intentional causes.

A marriage may be unfruitful from causes pertaining either to the male or to the female. More women than men are sterile, in the ratio probably of six to one, though de Sinéty makes it four to one. Sterility exists, however, in men much oftener than is commonly supposed. Its greater frequency in women is easily understood when it is remembered that the function of the male in reproduction ends with the discharge of the semen, but that the function of the female only begins then, and continues for a long time afterwards. If impregnation or fecundation occurs, some morbid action may interfere with gestation at any time in its course. Sterility then, of course, follows. Fertility implies, therefore, normal fecundation and gestation.

Let us first see how these processes may be thwarted in the female, and then consider in general the causes of sterility in the male.

1. Sterility may arise from an inability to perform coitus. Semen must be deposited by the male within the genital canal of the female. But impregnation becomes impossible from absence or very incomplete development of the vagina, atresia of the vagina, vaginismus, and imperforate hymen.

Most of the faulty developments of the external genital organs of the female may prevent coitus. Not infrequently the meatus urinarius is situated in a mere depression between the labia majora, and sexual intercourse has repeatedly taken place within the urethra.

The vagina may be partitioned (double vagina) so that there is stenosis. Intromission is then impossible. The labia minora may be adherent through their whole length. Great hypertrophy of the labia or clitoris may result from elephantiasis or tumors of some kind.

The hymen may be not only tough and imperforate, but also greatly distensible. If it is perforate, although it impedes coitus, pregnancy may ensue, for a drop of semen may be sufficient to give rise to fecundation, if it enters any minute orifice of the vaginal tube.

Vaginismus is a condition of the vulvar orifice in which all attempts to introduce the penis within the vagina cause extreme suffering. The sphincter vaginæ or the muscles of the pelvic floor may also be thrown into a spasmodic state. A digital examination or the insertion of a vaginal tube is attended by a similar spasm. A vulvar or vaginal inflammation, an erosion, or a fissure about the carunculæ myrtiformes is usually at the bottom of this trouble. A vulvar or vaginal hyperæsthesia explains some cases. Vaginismus also, but more rarely, exists in the upper vagina, from which the semen is then immediately expelled.

Sterility may ensue when there is pain in coitus, a condition called by Barnes dyspareunia. The causes of dyspareunia are manifold. These are vulvitis, vaginitis, milder forms of vaginismus, rough attempts of the male at coitus, excessive sexual intercourse, lacerations of the cervix uteri, uterine inflammations and displacements, ovarian inflammation and prolapse, periuterine inflammations, urethral caruncles, fissures of the rectum, painful hemorrhoids, etc. As, however, none of these prevent intromission or the deposit of the semen within the vagina, they need not prevent impregnation. If sterility results from any of them, it is not because of the symptomatic dyspareunia, but from the disorders themselves preventing impregnation or thwarting gestation.

2. Sterility may result from inability of the semen to enter the uterine cavity. Under these circumstances coitus may be painless and complete, but fecundation becomes impossible from atresia or stenosis of the os externum uteri or the cervical canal, flexions and displacements of the uterus, tumors of the uterus, and alterations in the quality and the quantity of the uterine discharge.

Rarely indeed do we see a completely imperforate os uteri.   Much

more frequently there is observed a partial occlusion or stenosis, which is congenital or acquired. The congenital form shows itself in what is called the pinhole os, with an elongated conoid cervix, a very common but not a certain cause of sterility. Quite generally this condition is associated with dysmenorrhœa. Acquired stenosis of the canal may be the result of a pernicious use of caustics, especially the nitrate of silver, so commonly employed years ago. Again, it may arise from a cicatricial contraction of the parts, from injuries during parturition, or after certain surgical operations, as trachelorrhaphy. This stenosis may be present in any part of the cervical canal, but most commonly it is at the os externum. No doubt in many of these cases of sterility other conditions enter into the causation. A very small os may allow the entrance of spermatozoids, as they very often pass through a smaller opening into the Fallopian tubes. Then fecundation may occur, although there may have been an obstructive dysmenorrhœa, and with it some mucous as well as menstrual retention. A secondary endometritis in time follows, and this adds to the causes of sterility. A coexisting dysmenorrhœa is always more easy to relieve than a sterility. A pinhole os externum, with a conoid cervix, is the most common of the congenital conditions creating sterility.

Various theories have been propounded to explain the entrance of the spermatozoids within the uterus. The uterus after a sexual orgasm has a certain suction power, but the chief agent is the inherent activity of the spermatozoids.

Uterine flexions and displacements lessen the chances of fertility. Both of these conditions are extremely apt to coexist with endometrial catarrh, which oftener causes the sterility than the obstruction. Malpositions are always associated with disorders of circulation, and the latter become the chief etiological factors of sterility.

Uterine tumors cause obstructions, but are followed sooner or later by uterine catarrh, and this clinical factor is always to be considered.

Anteflexion is a frequent cause of congenital sterility. Chronic endometritis, cervical, corporeal, or general, invariably increases the quantity and alters the quality of the uterine discharge. The spermatozoids are washed away and thus prevented from entering the uterine canal; their vitality also is impaired. There is no more common cause of sterility than this; certainly it is the most common of the acquired causes.

The vitality of the sperm may be destroyed by excessive acidity of the vaginal mucus. This condition exists, for the most part, in married women after one or more deliveries, and constitutes a variety of acquired sterility. Any cause which prevents the entrance of healthy sperm within the uterine canal may prevent fecundation; nevertheless, fertility may exist when seeming obstructions are found. Women vary greatly in their procreative powers. I have known conception to occur when the cervix uteri was seriously diseased from cancer, and when there was a vesico-vaginal fistula, although the urine is considered poisonous to the spermatozoids.

3. Sterility may result from an incapacity for proper ovulation. This is a cause of impairment of fecundation or insemination which is not so easily recognized as are the morbid conditions of the uterus that may be detected by touch and by sight. Under this head may be included any condition of the ovary which impairs the ovule, as chronic ovaritis in some of its forms, peri-oöphoritis, and cystic degeneration. These conditions of the ovary explain many obscure cases of sterility. Imperfect development of the ovule may also result from any general debilitating disease, as anæmia, scrofula, tuberculosis, or syphilis. Obese women are often sterile, no doubt from imperfect ovulation. A rich diet and a life of luxury diminish fertility ; a spare diet and poverty seem to favor it.

Gonorrhœa, it matters not how contracted, is a very common cause of sterility in women. Gonorrhœa in women not only causes vulvitis, vaginitis, and an inflammation of the vulvo-vaginal glands, with urethritis and cystitis, but, as a rule, it also causes endometritis, salpingitis, pelvic peritonitis, and oöphoritis. To Dr. Noeggerath we are indebted for a thorough elucidation of this subject. While experience has established much which he enunciated in 1872, it has been clearly·demonstrated that some of his statements, as to the frequency of the continuance of gonorrhœa in men and women after its seeming disappearance, are exaggerations. Gonorrhœa in either sex is a stubborn and long continued disease. It has many complications in both sexes, but especially in women. In some cases, no doubt, it has an indefinite continuance ; but cures are by no means impossible.

Ovulation may be perfect in the development of the ovule, but, owing to organic changes in the ovary or in the Fallopian tubes (hydro-, pyo-, or hæmato-salpinx), or to pelvic peritonitis, mechanically preventing an instinctive application of the fimbriæ to the ovaries, sterility results. To Bernutz and Goupil we are indebted for much of our knowledge concerning pelvic peritonitis. In many of these cases the ovule escapes from the ovary, but fails to reach the uterine cavity.

4. Sterility may arise from inability to continue and complete gestation. Although the sperm has entered the uterine canal and the fecundated product is within the uterine cavity, conception and gestation having taken place, still, this last physiological process of fertility is, for various reasons, not completed. Abortions occur early in gestation, and with great frequency. Ninety per cent. of all child-bearing women abort once or oftener during their lives. One out of twelve pregnancies ends in an abortion.

Abortions may also take place from traumatic causes, emotional violence, and pelvic and general diseases. The fecundated ovule, having entered the uterine cavity, may fail to find a suitable soil for its attachment and development. The causes of abortion are paternal, maternal, and fœtal. Syphilis is a very common cause. The development of the embryo depends very much on a normal condition of the decidua, and the healthy decidua depends greatly on a healthy endometrium. Catarrhal and syphilitic inflammations prevent and arrest gestation.

5. Sterility may result from a want of physical adaptation of the parties,—sexual incompatibility. A married life may be sterile for years, yet when either party obtains a new companion fertility may follow. Napoleon Bonaparte, for instance, had no child by Josephine, which led to his unlucky and inhuman divorce; he married again and had a child. Josephine was fertile by her first husband. There must be some physiological difference in the spermatozoids or the ovules of different persons. The sperm of some may be more active; the germs of others may be more susceptible of impregnation.

Contrary to what has been commonly believed, phthisical subjects do not show diminished fertility. The progress of phthisis seems to be retarded during pregnancy, but is always hastened after delivery.

Women very young in years have conceived long before puberty, while others advanced in years have been delivered long after the menopause.

Sexual enjoyment is not necessary for impregnation. Conception has occurred after a rape, or when the female has been under the influence of an anæsthetic or stupefied by alcohol or narcotics, and not unfrequently when she is perfectly passive or is disgusted with sexual intercourse.

Sterility is temporarily physiological after delivery, and usually, but not always, during the whole period of lactation. Not a few women avoid another pregnancy by prolonging the time of suckling, though conception during lactation is by no means uncommon.

The causes of sterility in the male are impotency, and also azoöspermia, when the seminal fluid contains no spermatozoids or only such as have a feeble vitality. The microscope alone detects this condition, which is found at times in men otherwise in good health and of normal sexual vigor. When normal spermatic fluid is deposited in the healthy vagina or cervical canal, the vitality of the spermatozoids ought to be maintained from five to ten hours or more.

Diagnosis.—The diagnosis of the morbid condition producing sterility is of the utmost importance. A judicious appreciation of the actual pathological state impairing or destroying the normal fertility is by no means an easy matter. Success in the management of sterility depends largely upon a correct diagnosis. At times all the means of diagnosis may be required. Touch, bimanual exploration, the speculum, the sound, the dilator, and the volsellum, together with inspection, palpation, percussion, and auscultation of the genital organs, are to be called into play, as needed.

Prognosis.—The prognosis is certain and favorable in some cases, uncertain and unfavorable in others, according to the conditions present. There is often great disappointment in the treatment of sterility.

Treatment.—The special treatment of all varieties is the removal of the cause, if practicable. This, of course, presupposes a correct diagnosis, and a determination as to whether the sterility is the fault of the wife or of the husband. In all cases of long-continued sterility, after having

thoroughly examined the female without finding a satisfactory cause for the same, the investigation should be commenced with the male. Obtain some semen from the vagina of the wife, within a short time after a coitus, for a microscopical examination. In case the cause is found with the husband, treatment of the wife is useless.

It is not in place here to speak of the management of sterility in the male. For barrenness of the female we remove and correct, as best we can, all causes which impede coitus. An atresia of the vagina, an imperforate hymen, or a bad vaginismus is to be overcome by appropriate, mostly surgical, means. Conditions, congenital or acquired, may be detected which render the treatment not only unsatisfactory but useless. If there is dyspareunia from vulvitis, vaginitis, vulvar hyperæsthesia, chronic endometritis, chronic metritis, chronic pelvic peritonitis, chronic salpingitis, chronic ovaritis, ovarian prolapse, displacements of the uterus, or a diseased urethra, bladder, or rectum, these need special care and attention. Removal of these diseases may prolong life, make it more comfortable, and increase the chances of impregnation.

If semen fails to enter the uterine cavity because of displacements or flexions of the uterus, this organ is to be replaced and maintained in a normal position. Most displacements of the uterus are secondary to, and associated with, endometritis or metritis, the correction of which is of the first importance.

Stenosis of the os uteri may be remedied by a crucial incision, dilatation, and galvanism with the negative pole within the cervical canal. Mild cases of stenosis are best treated by negative galvanization, which tends also to correct any coexisting cervical catarrh. If, however, there is a decidedly elongated conoid cervix, with a pinhole os externum, the best procedure is to curette the uterine cavity, for the resulting uterine catarrh, and then to excise a wedge-shaped piece from the infra-vaginal conoid cervix and to stitch the opposing cervical lips together. If thorough antiseptic precautions are taken, and if no peri-metric inflammation is lurking behind, this operation is simple and unattended with danger; otherwise it may be followed by an acute peritonitis and death, as simple discission of the cervix not unfrequently was in times past. Symmetry of the parts is best obtained by good incisions and a careful suturing.

Under no circumstances ought the woman's life to be endangered by any surgical measures. No operation should be undertaken unless it is absolutely certain that the fault is hers. Results are too uncertain and the risks too great to allow of unnecessary manipulations.

Chronic endometritis in its many forms is best combated by dilatation, curetting, and packing with gauze, followed by intra-uterine medication or intra-uterine galvanization.

"No grass grows on a well-trodden path." Prostitutes rarely conceive, partly, at least, because of their frequent coition. Rare indulgence favors fertility. If children are desired, great moderation is advisable.

Abstinence from sexual intercourse for months at a time is in some cases beneficial, not only by curing the disease which causes the sterility, but also by increasing the chances of impregnation. A separation of husband and wife for considerable periods is under many circumstances advisable.

If the uterus is absent or very small, less than an inch and a half in length, all efforts to insure fertility would seem to be hopeless. An ill-developed uterus, not less than two inches long, may be stimulated to grow if the patient is young and otherwise healthy.

In correcting by trachelorrhaphy the eversion, erosion, and hypertrophy of the cervix uteri following bad lacerations, it is important that the cervical lips be not so closely sutured together as to impair fertility, a not unfrequent result. A stenosis caused by the improper use of nitrate of silver needs correction by incisions or dilatations. A laceration of the cervix may cause sterility by impairing the retentive power of the uterus. Trachelorrhaphy is then indicated.

When is impregnation most likely to occur? Fecundation may in some cases result from coition at any time during the month. Nevertheless, it is true that it is most apt to occur within a week after the cessation of the menstrual flow. Doubtless a prolonged dorsal decubitus, with elevated hips, favors the retention of the seminal fluid within the vagina and aids impregnation, especially if there be a vaginismus of the upper part of the vagina.

Impregnation may occur and an early unsuspected abortion may take place. Most of these abortions result from undue frequency in coitus, from violence in the act, or from some impairment of gestation by endometritis.

Excessive acidity of the vagina is to be overcome by the internal use of alkaline Vichy water, and by vaginal injections of potassium carbonate in solution just prior to coition.

All the best-known tonics, iron, quinine, strychnine, arsenic, phosphorus, cod-liver oil, and faradic electricity, by improving the general health, favor fertility.

Artificial Impregnation.—Can anything be done artificially to promote impregnation? In those cases in which there is a serious obstacle to the passage of the sperm into the uterus this fluid may be introduced within the uterine canal by mechanical means. Being first assured by a microscopical examination that the husband's semen is capable of causing fecundation, and that there is otherwise no serious obstacle to gestation, the consent of both parties having been obtained, the following method may be resorted to. Normal coitus is practised. The woman maintains the recumbent posture, and within an hour afterwards a small quantity of the semen from the vagina is sucked into a properly constructed syringe warmed to the body temperature, and a few drops of the same are injected into the uterus beyond the internal os. The woman remains in bed for a few hours following this procedure.

Marion Sims has had the greatest experience with this operation, and it has been successful in the hands of Gérault, de Sinéty, and others. There is no reason why it should not be tried, in otherwise unsuccessful cases, when legitimate reasons make offspring desirable.

CHLOROSIS.

Chlorosis, one of the most common disorders of nutrition, is a form of anæmia characterized by certain blood peculiarities. It is rare in the male, but quite common in the female. In most instances it is associated with disturbances of menstruation, and it is usually present at the time of puberty, when the reproductive organs are especially developing. That it is a special disorder of nutrition is evidenced by its frequency among ill-fed, over-worked girls. Defective hygiene, in the way of poor food, lack of sufficient exercise, and impure air, and undue strain in mental exertion, are causes. It is, however, met with also in the upper classes of society and in girls of a good physical inheritance. There is always an anæmic state of the blood, the red corpuscles being deficient in number and lacking richness in hæmoglobin. There is weakness in the blood-forming and blood-propelling apparatus, the cause of which is to be sought for in some faulty condition of the mesoblast. In this disease the heart and the blood-vessels are usually small, but a compensatory hypertrophy of the heart may at times be present. The absolute number of the corpuscles may be diminished one-half, although the relative number may remain normal, while in the corpuscles themselves the hæmoglobin is greatly diminished. The percentage of hæmoglobin may be reduced from the normal one hundred to sixty or even fifty, making the red corpuscles noticeably pale. The serum may be normal in quantity, but the solids are reduced in amount.

There may be a defective growth of the ovaries and the uterus in chlorosis.

These changes and those of the circulation are not constant features. The disease in many instances undergoes rapid relapses. The symptoms are those of anæmia, as shortness of breath, palpitation of the heart, and swooning phenomena. The pulse is accelerated and easily excited. The complexion is peculiar,—not the blanched color of hæmoglobin loss, but the curious yellowish-green color which gives the disease its name of "the green sickness." The appetite is disordered, and there are indigestion and constipation. Cardiac murmurs are heard, simulating organic diseases of the heart. Menstruation is almost always deranged, and hysterical manifestations are frequent. Menorrhagia is very rare, amenorrhœa very common.

In diagnosis we must bear in mind the possibility of the symptoms being due to constitutional syphilis or to some organic disease of the stomach or the kidneys.

Treatment.—Iron is almost a specific. It should be given in fair doses and continued for a long time. Bland's pill of carbonate of iron is one of the most efficacious preparations. The other preparations of iron

are the dried sulphate, tincture of iron, and glycerole of chloride of iron. The red corpuscles will often greatly increase in number and improve in quality under the use of iron. The progressive development and the increase in number of the red corpuscles can be estimated with the hæmocytometer.

In rare cases the beneficial results of iron cease after its administration is discontinued. It is well then to give arsenic for a period, or iron and arsenic may be combined, as follows:

> R Pulv. ferri redacti, Əii;
>   Quiniæ sulphatis, Əii;
>   Acidi arsenosi, gr. i;
>   Ext. gentianæ, q. s.
> M. et ft. massa in pil. xl div.
> Sig.—One pill after each meal.

Chalybeate waters are always beneficial. The tincture of nux vomica with hydrochloric acid is an efficient remedy for chlorosis. While medicines are given, a strict attention is to be paid to hygiene in food, air, and exercise. The diet should be rich in albumen and easy of digestion. Lean and spare patients need fats and the carbohydrates. Malt and cod-liver oil are useful in certain cases. Exercise in the open air, taken as freely as can be borne with comfort, is needed.

Iron is sometimes very disappointing in its therapeutic effects. Unfortunately, its medicinal administration as commonly practised has little or no scientific foundation. The etiological factors entering into the production of anæmia and chlorosis in consequence of digestive disorders and faulty assimilation are not so clearly understood as might be wished. Anæmia and chlorosis have a multiplicity of causes, some of which are quickly amenable to iron, while many others persist uninfluenced by this remedy. All the salts of iron seem to be most efficacious if first acted upon by the hydrochloric acid of the gastric juice and thus converted into chlorides: hence the tincture of the chloride acts better than any other chalybeate, when it is tolerated by the stomach.

Hæmogallol and hæmal are new preparations, which Professor Kobert has highly recommended for these and other conditions indicating the use of iron. They are said to be more easily transformed into blood-coloring matter by the organisms of debilitated persons than any other ferruginous preparations.

DISEASES OF THE NERVOUS SYSTEM DEPENDENT UPON DISORDERS OF THE PELVIC ORGANS.

The various systems of the female economy are in intimate relations with the pelvic organs in health and in disease. We call these hysteroneuroses when the symptoms resulting are from disease. Hystero-neuroses are phenomena simulating morbid conditions in an organ anatomically

healthy, but due to morbid changes in the uterus and ovaries. Of these two the uterus is generally the offending organ. There is a sympathetic hyperæsthesia, due to reflex action, from the uterine derangement. This is proved by the fact that these phenomena are intractable to treatment addressed to the symptoms, but are amenable to treatment directed to the causative pelvic disorder.

It is a matter of daily occurrence to witness the disorders of pregnancy. Almost as frequently we see the physiological changes in the system at large which result from menstruation, particularly at puberty and at the menopause. They are varied in character, as determined by ramifications of the ganglionic and spinal nerves and centres. When the organ receiving the impulse is in a state of lowered vitality and lessened resistance or of hyperæsthesia, or when the nerve-tracts are in a condition of morbid irritability, these reflexes are stimulated and heightened. Hence disorders of many parts of the body, the nervous system in particular, arise from functional or organic changes of the pelvic organs. Excitability is a common property of all living parts, and is an essential condition of life. A great variety in the alterations, as regards seat, character, and intensity, renders it impossible to connect them at all times with the symptoms of any definite kind.

Menstruation in its systemic phenomena modifies and aggravates goitre, the diseases of the skin, varicose veins, fibroid tumors, and the circulatory changes of the brain, in health and in disease. The influence of disordered menstruation manifests itself in the brain (sleeplessness, melancholia, dementia, and mania); in other parts of the nervous system (local paralyses, epilepsy, and catalepsy); in the larynx (aphonia); in the heart (palpitation); in the lungs (cough, asthma, and dyspnœa); in the stomach (nausea, vomiting, and indigestion); in the intestines (tympanites, diarrhœa); in the kidneys (hypersecretion of urine); in the skin (eczema, acne); in the breasts (disturbances of the lacteal secretion, pain, localized enlargements); in the joints (pain, false ankyloses), etc. But for all practical purposes we may say that the resulting disorders of the nervous system partake of the nature of chorea, hysteria, epilepsy, hystero-epilepsy, migraine, and neurasthenia. These, together with nymphomania and other varieties of a perverted sexual appetite, onanism, and insanity, will be especially referred to.

An irritation starts from the site of an organic lesion, and proceeds to the nerve-cells at the base of the brain and the upper part of the spinal cord. Reflex action of the sympathetic explains many of the diseases of women. Any irritation will travel on the lines of the least bodily resistance, and the degree of transmission depends also on the subject affected. Through this irritation the nerve-cells undergo alteration of their nutrition, and after a time acquire a morbid excitability which is the essence of the disease. We may never know what cells are altered. The changes in them may be more dynamical than physical: the microscope may be unable to detect any differences. No special lesion is constantly present.

Recent pathology has taught us how serious distant diseases may be started through reflex action. All the hystero-neuroses may persist after molecular changes have continued for an undue length of time.

Let us now consider each of these diseases in a more definite manner.

CHOREA.

This nervous disease has a very obscure pathology. It is beyond the scope of this chapter to give the theories which have been advanced or to refer to the morbid conditions which have been found in connection with it.

Chorea consists in an exaggeration of those muscular movements which are constantly taking place, especially in children, who have not as yet acquired the power of governing the actions of their muscles. The movements are incoherent and devoid of character or rhythm. Chorea is most probably a functional disorder, beyond the reach of an anatomical demonstration. Among the causes, predisposing and exciting, we must not neglect to recognize those of a reflex nature, as intestinal worms, rectal fissure, and disorders of the genital functions. Pregnancy is a very common cause,— the disease commencing early in the third month, in those who have had it in childhood and who are otherwise predisposed to it, and subsiding after parturition. The disease is three times as frequent in girls as in boys, especially at the time of its most common occurrence, puberty. It can at times be distinctly traced to retroversion of the uterus, laceration of the cervix uteri, or dysmenorrhœa.

The best treatment consists in removing any tangible cause. The administration of a highly nutritious and easily digested diet is essential. Fats are a necessary element of the diet. Quiet and rest combined with nutritious food do more good than medicines. Sea-air and sea-bathing are to be highly recommended.

A moderate labile galvanic current applied daily to the spine, and arsenic, given internally, at first in small and then in gradually increasing doses, followed by cimicifuga, strychnine, iron, and quinine, are the best remedies.

Moral treatment is indispensable. Remove mental strain, control study, correct improper habits, and strengthen the will-power. These are potent means to regulate the life of a choreic patient, and are always conspicuous for good.

HYSTERIA.

In this disease there is a functional disturbance of the nervous system, with much mental perversion. Although confined almost entirely to the female sex, it is not always so limited. Herein lies the proof that hysteria is not dependent alone on uterine or ovarian diseases. When the malady is present in a female, there may be no tangible evidence of any pelvic disorder. But there is no doubt that local affections of the genital organs have much to do with the causation of hysteria. It is more common during pregnancy, and its symptoms are most apt to appear at the catamenial

periods. Erosions or lacerations of the cervix, chronic endometritis, mal-positions of the uterus, and dysmenorrhœa produce and perpetuate hysterical phenomena in subjects predisposed to it by inheritance, sedentary habits, idleness, vicious practices, or any excessive development of the emotional nature. Hysterical symptoms subside when the local disease is cured. Ovarian diseases also, as oöphoralgia, ovaritis, and ovarian prolapse, are causative.

Hystero-epilepsy, for the elucidation of which we owe much to Charcot and his pupils, is a disease in which certain convulsions like epilepsy occur in hysterical patients, especially at or near the menstrual times. It is unlike epilepsy in its typical form, although cases with both disorders in one person may present difficulties in diagnosis. Hysteria alone is generally present, but it takes on a semblance to epilepsy. The attacks may be very frequently repeated, but are less severe and much less grave than those of epilepsy.

Firm pressure over the ovaries during an attack modifies or causes a complete relaxation of the spasm, and a return to consciousness, followed by a relapse on removal of this pressure. Hystero-genetic zones exist in various parts of the body, as over the breasts and ovaries, especially the latter.

Treatment.—In the treatment of these disorders, ascertain the cause or causes, and deal with them, if practicable. If there are symptoms of any uterine or ovarian disease, a pelvic examination should be made, but never unless there are strong reasons to anticipate that such diseases may thus be detected and that some benefit will result. While unnecessary examinations are to be avoided, an hysterical patient should not be allowed to continue in her sufferings without an examination being suggested, if indicated by the symptoms.

Always improve the appetite, if it is poor; correct the digestion, if it is impaired. Direct a regular and nutritious diet. Secure daily normal alvine evacuations. Open-air exercise, to the extent of fatigue, should be insisted on. The reading of sound, wholesome literature, avoiding cheap and sensational novels, supplies good food for the mind. Cold baths —better, cool sea-baths—are valuable adjuncts. Anæmia and debility are to be combated by iron and vegetable tonics. Strychnine generally aggravates the disease. Cimicifuga is a valuable remedy if there are menstrual derangements. The use of alcohol and narcotics is always to be avoided.

For the convulsions, when there is no doubt that they are due to hysteria, a sudden shock may be given to the nervous system, as by the pouring of cold water over the head and face, which is often followed by a return to consciousness, and a suggestion of its repetition may prevent another hysterical attack.

Amyl nitrite will arrest the paroxysm of hysteria or hystero-epilepsy. The bromides and arsenic are the best remedies during the intervals

between the attacks. Local paralyses are best managed by massage, passive motion, and electricity. Aphonia generally yields to electricity.

Diseases of the uterus and its appendages, when present, should be rectified. Always avoid unnecessary manipulations of the genital organs.

Change the surroundings, if the family and friends are deleterious in their influence. Excessive sympathy is as injurious as are ridicule and abuse. Over-solicitude during attacks aggravates them and renders them more frequent. Gain the confidence of the patient, and arouse her to a systematic exercise of her will-power and self-control. Electricity is very beneficial, in the form of general faradism.

In obstinate cases, uncontrolled by other means, the Weir Mitchell treatment, by seclusion, rest, forced feeding, massage, and electricity, is highly advisable.

Although cures may be effected by hypnotism, its practice involves the risk of aggravating the patient's condition. Oöphorectomy for hysteria and hystero-epilepsy has been much abused.

Graily Hewitt contends that hystero-epilepsy is largely due to reflex irritation having its seat within the uterus, and that this irritation is caused by flexion of the uterus. This is no doubt true of some cases, but their number is relatively small. A more common cause is a diseased condition of the Fallopian tubes and ovaries.

In all cases which are clearly due to some reflected pelvic irritation, medicinal and hygienic measures should be tried first. After these have had a fair and continued trial, surgical operations may justly be considered. Unrelieved local pelvic disease, causing much pain, impairing usefulness, and exciting hystero-epileptic attacks, may be combated by surgical means. The gynæcological records of the last few years point unmistakably to the direct relationship, as cause and effect, of the two diseases, and prove that cœliotomy performed as a *dernier ressort* is not only justifiable, but necessary. But not every case so operated on has been bettered. Again and again have the attacks continued as bad as before. Past experiences warrant the following directions. Do not perform cœliotomy for hystero-epilepsy unless unmistakable evidence of some structural or organic change can be detected within the pelvis. Be assured that this is the source of irritation, and that the nervous phenomena cannot be relieved by general medicinal and hygienic measures.

MIGRAINE.

Migraine, or hemicrania, is a very common form of headache, and an extremely distressing complaint. Because so frequent and so intractable, it deserves most earnest consideration. Generally accompanied by certain vaso-motor changes, it indicates circulatory disturbances.

We recognize two forms of this nervous disease, the spastic and the paralytic. In the first the painful side of the head, generally the left, becomes pale and shrunken, the pupils are dilated, the ear is cold and pale,

the temporal artery is tense and hard.   The pain in the temple is increased by pressure on the carotid.

In the paralytic form of the disease the face and ear are hot, red, and swollen, the eye is injected, and the pupil is contracted.   The pain in this variety is diminished by carotid pressure.

The vaso-motor symptoms are at times very imperfectly defined.   In the spastic form the vessels of the affected half are more or less contracted, due to an irritation of the cervical sympathetic; in the paralytic form there is a vascular dilatation, from paralysis of the sympathetic nerves.   The cervical sympathetic is the site of this pathological lesion.   Fluctuations in the arterial supply set up irritation of the sensory nerves in the skin, the pericranium, the cerebral membranes, and the sensory portion of the cerebral cortex.

That two such opposite conditions, anæmia and hyperæmia, can cause such a nerve-storm seems rational when we know that epileptiform convulsions may be so caused.   Some cases show a marked regularity, attacks recurring at intervals of varying length.

Migraine is very often an inheritance, direct or indirect, being directly inherited from the disease itself in one or the other parent, or indirectly transmitted from some other neurosis, as epilepsy, insanity, etc.   Prolonged wear, mental strain, loss of sleep, and sexual excesses are causes, especially in the anæmic or debilitated.   Gout is sometimes a cause.

Females have this disease more often than males, particularly at the period of puberty and towards the climacteric change of life.   Many women have it only just before, during, or immediately after menstruation.   Of course, genital diseases, functional or organic, may aggravate it, but we do not believe that the disease originates exclusively from this source.   Recognizing the systemic changes incident to menstruation, and that the menstrual phenomena are followed by intermenstrual phenomena in the nervous and circulatory systems, we can understand how this disorder is more apt to be aggravated by this pelvic function, and how it may show itself only at the menstrual periods.   All women are more susceptible to neurotic manifestations at such times, and all the sympathetic disorders are then most apt to show themselves.   Vascular tension, like nerve-tension, is diminished after the menstrual epochs.

Treatment.—In order that any permanent relief may be obtained, the state of the general health must receive special attention.   We must do what we can to elevate the standard and increase the stability of the health of the whole system.   All tangible diseases must be removed and all recognized functional disorders corrected.   During the interval iron and quinine are called for if there are anæmia and debility.   The last of these remedies may be given before, and the former after, meals.   Constipation must be relieved.   Cod-liver oil is highly useful when given during the cooler months.

If there is a gouty diathesis, give the iodides.   If visual refraction be

at fault, this error should be corrected by appropriate glasses. The diet should be regulated. A change of air, scenery, and association almost always does good, and sometimes effects a cure. Menstrual disorders may call for attention.

The best medicines to prevent attacks or mitigate their frequency and severity, besides those previously mentioned, are arsenic, cannabis indica, and zinc phosphide. Fowler's solution may be given, in doses of from three to five drops, after meals, for weeks or months. Its use lessens the frequency of the attacks of migraine. A good plan of treatment is to give two grains of quinine before meals and three drops of the arsenical solution after meals. To do good, they must be continued steadily for a long time.

Cannabis indica, in the form of the extract, is also very useful when administered for a considerable period. Arsenous acid and extract of cannabis indica may be combined, or the extract of cannabis indica may be given with zinc phosphide. A very efficacious combination of remedies is:

> ℞ Zinci phosphidi, gr. ii ;
> Strychniæ, gr. ss;
> Ext. cannabis indicæ, gr. x.
> M. et ft. massa in pil. xx div.
> Sig.—One pill three times a day during the intervals.

For the attack itself the following remedies are very beneficial. Tincture of nux vomica in doses of one drop every fifteen minutes is useful in cases attended with stomach disturbances. Cases of the spastic form of the disease call for nitro-glycerin or nitrite of amyl, while those of the paralytic type call for ergot or antipyrin.

These medicines are too often prescribed indiscriminately, without regard to the variety of the migraine. Those remedies are most effective which counteract the existing abnormal vaso-motor condition. Thus, in migraine accompanied with vaso-motor spasm, glonoin, amyl nitrite, alcohol, or quinine will relieve pain and abort or arrest the attack. They dilate the cerebral blood-vessels. Such remedies as the bromides and antipyrin, which contract the capillaries, act best if given when there is vaso-motor dilatation. Antipyrin may be given in doses of five grains every two hours during the attack, from its commencement, or smaller doses may be given oftener. Antipyrin and bromide of sodium unite well in an effervescing mixture. Antipyrin and phenacetin owe their analgesic properties to their effects on the sensory cells of the central nervous system, diminishing their irritability. Antipyrin and ammonium bromide form an excellent combination.

Sodium salicylate, in doses of three grains every half-hour, is sometimes quite efficacious in similar cases; so also is salipyrin.

The bromides are admirably adapted for headaches attended with cerebral irritability and excitability. They arrest functional activity of the brain, secure sleep, and diminish pelvic congestion.

Brain-weariness and exhaustion are most favorably influenced by caffein and guarana. The effervescing salts bromo-caffein and phospho-caffein are very good. Caffein is a powerful cerebral stimulant; it is also a heart-tonic, increasing the arterial blood-pressure. It is one of the best remedies that we have to increase absolutely the activity and the capacity of the human brain for work. Headaches due to brain-exhaustion and anæmia indicate its use.

One of the most trustworthy remedies for the attacks of sick-headache is cannabis indica. This remedy is not only reliable when given for a long time during the intervals between the attacks, to prevent another attack, but is also very valuable during the attack itself, given in doses of ten drops every three hours. Its use is clearly called for in cases associated with or dependent on such menstrual disorders as menorrhagia and dysmenorrhœa.

All cases are benefited by maintaining the horizontal posture and by perfect quiet in a darkened room. Cold to the head will do good in the paralytic form of the disease, and hot water in the spastic form.

The hypodermic use of morphine has been greatly abused in the treatment of this disease. Of course pain is relieved thereby and sleep is secured, but if continued for any length of time its future use is depended upon, and the morphine habit is created. Antipyrin and phenacetin are antipyretic, analgesic, and hypnotic.

Galvanism persistently used has produced good results. It is both prophylactic and curative. Almost every attack is relieved by it, but its successful employment must be based on scientific principles. The polar effect is always to be sought. While it has been applied over the mastoid process, in the spastic form of the disease it will often be found better to place the anode over the sympathetic nerve, at the site of the pain, or in the auriculo-maxillary fossa, while the cathode is placed over the upper cervical region. In the paralytic form of the disease the cathode should be substituted for the anode. A good way is to apply the anode over the frontal region and the cathode to the lower cervical region. In the spastic form the positive pole is applied to the forehead and the negative pole is held in the hand, while in the paralytic form the negative pole is applied to the forehead and the positive pole is held in the hand. The polar effects are thereby best secured.

NEURASTHENIA AND SPINAL IRRITATION.

Neurasthenia is a constitutional neurosis which is due to deficiency or exhaustion of nerve-force. Spinal irritation, a local spinal neurosis, is a symptom of spinal exhaustion. Both of these conditions, especially the latter, are much more common in women than in men. Spinal irritation to some degree is most frequent in the higher classes of society, in women between fifteen and forty-five.

Coccygodynia is at times a distressing form of spinal irritation, affecting

the tip of the spine in the region of the coccyx. It often accompanies irritation of other portions of the spine.

In neurasthenia there is a weakness of the nervous apparatus, associated with undue irritability, mental and physical. These manifestations of weakness and irritability show themselves after the least provocation, by undue excitement and fatigue. There is also a lack of vigor, efficiency, and endurance, a want of mutual support and control in the different parts of the nervous organization. The patient is unequal to the ordinary tasks of life. Everything is done with undue exertion. Even talking and thinking are exhausting. She becomes a subject of many morbid fears.

These symptoms may coexist with some functional disorder of the brain, with an incapacity for mental exertion, and with much mental irritability, some disturbance of the special senses, and insomnia; or they may show themselves in other parts of the nervous apparatus, as the spinal and the sympathetic system, by disorders of the sensory or of the motor functions, and by vaso-motor changes. All such patients are easily agitated, very sensitive and timid. They are often, though not always, spare in body, anæmic, broken down in health, and at times bedridden. There is a predisposition to chorea, hysteria, or hystero-epilepsy. These functional nervous disorders may be associated with neurasthenia.

There is no known distinct anatomical change underlying the manifold symptoms of neurasthenia. Affecting all parts of the body, the symptoms are too often referred to the generative organs, especially in women.

Doubtless this disease is much more frequent in this than in any previous century. Clearly our modern American life favors it, for nowhere is it more common than in our larger cities. Here the wear and tear of life are in excess. Our climate may have something to do in producing the disease, but, at any rate, the social exactions of our modern society are very great, and housekeeping is much more complex than formerly.

Neurasthenia can be ascribed to a great variety of causes. A bad inheritance in the way of temperament, lack of judicious physical exercise in youth, undue strain of the brain in study or occupation, social disappointments, sexual excesses, business and domestic excitements and anxieties, and pelvic diseases, enter into the causation of this trouble. The latter conditions particularly concern us here. Female sexual diseases may be direct causes. More often they are but associated or, it may be, resultant conditions.

Any female pelvic disease which gives rise to pain, frequent and excessive menstruation, or profuse leucorrhœa may directly bring about neurasthenia. There is a difference in the effects of chronic uterine and ovarian diseases in these respects, as there is a difference in the inherent and acquired vital resistances of constitutions. In some cases grave disease causes little or no disturbance, while in others a slight local disorder is followed by a multiplicity of symptoms. The most potent local pelvic affections creating

reflex disorders are chronic oöphoritis, ovarian prolapse, and especially lacerations of the cervix uteri. Cervical tears almost always heal by second intention, and by the formation of some cicatricial tissue. They bring about eversion, erosion, granular degeneration, cystic degeneration, and chronic uterine catarrh. Pain is created, and reflex disturbances are set up. Not all lacerations of the cervix need trachelorrhaphy, but in some cases nothing else will be efficacious for good. Few, if any, morbid conditions of the cervix demonstrate in a greater degree these results of the varying susceptibility of the nervous system to pain and reflex irritation.

Treatment.—The cause of the disease is to be removed, if recognized. Unfortunately, the causes are at times not satisfactorily made out, and we are forced to address ourselves to the general condition. The next indication is to improve nutrition as well as we can. The nervous system should be fortified by food to do its work at the best possible advantage. The wear and tear of life are thus diminished, by calling into service a fuller reserve, and thus we conserve the vital expenditures.

Since many neurasthenics are such only in certain surroundings of climate, business, home and friends, and enjoy good health when leading a simpler life, involving less care and responsibility, we do such patients the best service by changing their places and methods of living.

Sufficient sleep is always to be secured, not by means of medicines, but by systematic muscular exercise in the open air, by a quiet life, and by an early retiring to rest, aided, it may be, by the administration of some food at this time. An hour of rest each afternoon is always desirable. Mellin's food, with hot milk, or malted milk, is often very good for this purpose. The partaking of a glass of pure rich milk some two hours after the breakfast, at luncheon, and at bedtime, is to be favorably considered. Alcohol needs to be very cautiously prescribed for neurasthenics. Wyeth's liquid malt is one of the best forms.

The best medicines are arsenic, cod-liver oil, iron, and phosphorus. Arsenic acts best on persons of the lymphatic or nervous temperament. Coexisting menorrhagic disorders are also best controlled by its use. Cod-liver oil, pure, or emulsified with the syrup of lacto-phosphate of lime, is to be prescribed during the colder months, after a proper regulation of the stomach. Phosphorus, in the form of zinc phosphide, or free (in Fairchild's elixir of calisaya bark), is an excellent remedy.

Cases of pronounced invalidism from neurasthenia require a special treatment. The rest-cure, elaborated by Weir Mitchell, is pre-eminently useful. The more chronic and more pronounced the case, especially when hysterical phenomena are present, the greater the prospect of a speedy and complete cure. Seclusion, forced feeding, rest, massage, and electricity, all are of signal benefit. No one of these can be safely omitted.

Abundant rest is thus secured; a tired brain is put at ease, for the mind is diverted and not excited; and, with massage administered once or twice daily, exercise is given to all parts of the body, without exertion. Sleep,

also, is thus secured. Pelvic congestion is diminished by the recumbent posture of the body. The circulation of the blood is equalized by massage. Nutrition is favored by forced feeding. Excretion is not neglected. The tonic effects of electricity are obtained by a well-regulated administration of this agent. By all, life is started anew; a complete transformation is inaugurated.

Patients with spinal irritation are likewise benefited in this way. But in the treatment of these cases galvanism should not be neglected. Hammond has contended that spinal irritation is the result of spinal anæmia, because the spinal pain is almost always ameliorated by the recumbent posture and is aggravated by the erect position.

Such cases are most improved by a labile upward galvanic current, the positive pole being applied to and below the regions of the spinal tenderness, while the negative pole is placed at the sixth or seventh cervical vertebra. The experience of the author convinces him of the efficacy of this method of applying the constant current. Whether the improvement caused by it is the result of increasing the spinal circulation is not so conclusively proved.

General faradization, and especially local pelvic faradization, with a very long thin wire for the secondary current of tension, one pole being within the vagina or rectum, is an admirable remedy in cases associated with, or dependent upon, intra-pelvic disease. Not only is there mitigation of any existing pelvic pain by an improvement of the pelvic circulation and an increased tonicity of any relaxed muscular fibres, but the common attendant symptom of constipation is relieved without laxative medication.

In no class of diseases within the domain of the gynæcologist and the neurologist is it more obvious than in this that success in the management of the various neurasthenic conditions is largely in proportion to the degree in which we win the confidence and stimulate the faith of our patient. All intelligent co-operation will surely be rewarded.

INSANITY.

A great many theories about this disease have in times past governed the medical mind. The importance of clearly distinguishing what may cause and maintain insanity, and of determining which of two diseases present exists independently, cannot be overestimated.

Insanity is either of central or of reflex origin. For our present purposes all cases may be classified as follows: first, those which are purely central, from cerebral causes; second, those which are the result of female sexual diseases, from reflex causes.

It is the province of this chapter to speak only of cases which are purely reflex from pelvic causes. These cases are noticed about the age of puberty, after marriage, during and following parturition, and at the climacteric period. These times appear to be periods of special susceptibility in

women. At the same time we must remember that purely central conditions produce or arrest pelvic symptoms and modify female pelvic functions. A few cases of female sexual disease are bettered by the cerebral disturbance; most are made worse. Again, the two conditions, cerebral and pelvic, may coexist, or they may be purely independent. Mental derangements frequently disturb the functions of several organs of the body, or modify action, healthy or diseased, in them. Why not the pelvic viscera? Menstrual disturbances are to be regarded as both cause and effect. The vast majority of all cases of insanity arise from conditions and circumstances which depress and exhaust the nervous system. Extraordinary functional activity of the sexual organs involves a great demand upon the whole organization. Frequent child-bearing, with lactation, causes an excessive drain on the whole body. The most frequent occurrence of insanity in women is under such circumstances. In most women mental depression, to a greater or less degree, is experienced at the menstrual times, from causes entirely physiological. Many cases of insanity, even those not reflex in their origin, are worse at the catamenial periods.

Insanity at the menopause we all recognize, and it is very properly called climacteric.

The most common cause of amenorrhœa is impaired general nutrition. Most of the anæmic conditions favor menstrual suppression. Mental shock and prolonged anxiety so act. Insanity always impairs the general nutrition of the body and disorders innervation. Hence the insane are very often amenorrhœic. The uterine function is restored only after an improvement of the general health.

Any disease of the uterus or ovaries in a highly sensitive organization may cause mental derangement, which subsides only when the causative disease is overcome. The irritation and exhaustion from the pelvic disease may be the exciting cause of insanity, while the predisposing cause resides either in an altered or deranged nervous system or in some lesion of the brain, inherited or acquired. Horatio R. Storer, in his excellent work on insanity in women, contends that this disease when developed during the existence of uterine or ovarian affections is the result of reflex irritation. Unquestionably his statements are in the main true, but they are too positive. While the reproductive organs exert a potent influence on the mind in health and in disease, not all cases of insanity in women are caused by pelvic diseases. These affections do not occupy so important a position in the etiology of insanity as one would be disposed to think from Storer's statements. Insanity in women proceeds from the same general causes as insanity in men, though possibly oftener, on account of the general impressibility of their nervous system and their higher emotional nature. Not only are women subject to a host of diseases peculiar to their sex, but these diseases greatly modify their natural disposition and character. Their lives are subject to perpetual changes. Sex is in reality the predisposing, the exciting, and the continuing cause of much of the insanity in women. The

relative frequency of insanity in the two sexes is a subject of much observation. Mental disorders are probably more common in women than in men. The vast amount of statistical information on this point is not altogether reliable. More females than males are found in the asylums of our country, though more females than males recover from their first attack of mental aberration.

Fifteen per cent. of all cases of insanity in women arise during the discharge of the maternal functions. Depressing emotions, as shame and mental distress in the unmarried, and other accessory causes, vary greatly in different cases, but the inherited or acquired neuropathic condition is fundamental.

Puerperal insanity is brought about by the exhaustion of nerve-force and the anæmia in the puerperal state. Septic causes also doubtless favor its occurrence. Lactation causes insanity by producing exhaustion and anæmia. In these cases an hereditary tendency can often be traced. Insanity following pregnancy is brought about, in part at least, by impairment in the quantity and quality of the blood. When it manifests itself early in pregnancy, it is, no doubt, in many cases reflex.

The menopause is to woman, in her physical relations, a most critical period of life.

We must not misapprehend the sexual manifestations of insanity. Symptoms should not be taken for causes. The perversion of the appetites is one of the premonitory symptoms of this disease, and is the essence of all mental aberrations, the sexual instinct being no exception to the rule.

Some inherited weakness of the nervous centres must be assumed, in order that any uterine or ovarian disease may produce such functional mental changes.

From seventy to eighty per cent. of all cases of insanity are curable, if judicious treatment is instituted in the first month of the disorder. A longer duration than six months of the disease is attended by a rapid decline in the rate of recoveries. In the first manifestations of the mental derangement the brain is affected only functionally, but destructive molecular changes are likely in time to occur insidiously. Puerperal insanity furnishes a large percentage of recoveries,—probably eighty per cent. at the least.

Treatment.—To deal even in the briefest way with the treatment of the various forms of insanity is beyond the scope of this article. A great variety of pathological conditions—mania, melancholia, dementia, monomania, etc —the alienist will be called on to treat. As insanity is a disease of the whole nervous system, and as the entire physical organization, with every function of the body, becomes involved, the system at large must be treated. We are to recognize causes and circumstances depressing and exhausting the nervous system in all cases. There is no specific treatment. We are to treat patients irrespective of the form of the malady. Thus the broadest principles of treatment should guide us. Urgent symptoms,

as constipation and insomnia, may first need attention. To secure sleep the bromides and chloral are called for. The bromides are especially useful because of their quieting influence upon the brain, and because they tend to diminish pelvic congestion. Hyoscin is particularly serviceable when there is excessive motor irritability. When it secures sleep, this change indicates the first improvement in the disease. Dangerous exhaustion is always to be guarded against.

In all cases of insanity referred to in this chapter, those dependent upon pelvic causes, and, in fact, in all cases in women, a careful inquiry is to be made in reference to existent pelvic symptoms and to signs of intra-pelvic affection. If there is the least indication, from the history obtained, of uterine or ovarian disease, a thorough gynæcological examination is to be made, always in the presence of one or more witnesses.—The questions now come up, Which disease started first? Which disease is the seeming cause? Is the case post-puerperal or climacteric? Does the mental aberration exist independently, or do the two diseases, the pelvic and the cerebral, hold any relationship? This examination involves inquiry as to the age, the social relation, the menstrual functions, and the existence of any organic sexual disease. Obscene talk on the part of the patient does not indicate the presence of such disease.

The intra-pelvic examination may demand the employment of an anæsthetic. Ether or chloroform may be used for this purpose, but experience teaches us their inferiority to nitrous oxide gas, which may be administered in the method employed by dentists. Anæsthesia is induced by it, and the effect on the disturbed cerebral functions is generally very beneficial. Dr. Shaw, medical director of Kings County Insane Asylum, Flatbush, has observed no unpleasant effects from its use. On the contrary, it has proved to be a valuable tonic in cases of extreme debility of the nervous system, and experience has shown its use in the treatment of insane women with pelvic disease to be a valuable contribution to gynæcology.

Nothing will be said here as to the general management of cases, with regard to diet, baths, stimulation, medication, how and when to divert and to amuse, or how and when to restrain, if necessary. Any pelvic disease which may be the immediate or seeming cause of the insanity, as endometritis, erosions of the cervix, chronic pelvic peritonitis, ovaritis, ovarian prolapse, and cervical cicatrices, with uterine displacements and neoplasms, should have special treatment. Whether the cause or not, they certainly exert an unfavorable influence on the mental derangement, and should be corrected as soon as practicable. I firmly believe that the staff of every large insane asylum for women should have for one of its members a competent gynæcologist, with broad and comprehensive views of pathology and treatment. The greatest tact and experience will be needed to determine when to resort to local medication, and how often to repeat it, or when to interfere surgically. A judicious local treatment will at times be rewarded by the disappearance of the cerebral irritation and insomnia, as

if by magic. The promptness of the relief will depend largely upon the duration of the insane phenomena. Secondary disease does not always disappear when the primary cause has been removed. Chronic mania will at times remain unchanged. Not only should gynæcological examinations be made in the presence of a witness, as already stated, but care should be taken to avoid undue frequency of local inspections and applications.

When the disease is far advanced, the details of treatment can be carried on only in institutions designed for the purpose and furnished with all needed appliances for isolating, watching, exercising, amusing, and instructing patients. Confirmed cases certainly should be placed in an asylum, but very mild cases, at least at the beginning, may be better managed in certain homes and surroundings.

In the management of insanity no fixed, machine-like treatment is adapted for all cases. Treatment must be adapted to cases and conditions, and will be efficient and satisfactory in proportion to the degree of individual care and attention bestowed.

NYMPHOMANIA.

"Sexual feeling," says Maudsley, "is the foundation for the development of the social feeling." When the sexual feeling in the female is excessive or perverted, it is called nymphomania. This form of erotomania is a disease in the female like satyriasis in the male. There is mental perversion always attended by uncontrollable sexual passion. To gratify the sexual appetite, in advanced and confirmed cases, all the decencies and proprieties of life are sacrificed. It is a delirium of lust, a psychical desire engrafted on a markedly neurotic temperament, or a disease excited by impure reading or association. The imagination calls up sexual images, which may lead to hallucinations and illusions. Nymphomania in its most severe forms is associated with or dependent on certain varieties of insanity, with or without gross brain-disease. Although this disease is observed in children and in octogenarians, it occurs most frequently at the beginning or at the end of menstrual life. The genital organs are constantly in a state of turgescence. There is the greatest perversion of the sexual act, gratification being sought not only in masturbation, but also with others of the same sex, the patient playing the active or the passive *rôle*. In many instances this disorder is a reflex manifestation, from an irritation of the genital organs. Thus, certain diseases of the uterus and of the appendages give rise to nymphomania. The local exciting causes are intestinal, especially rectal, the presence of worms, hemorrhoids, inflammations of the vulva, vagina, or rectum, various eruptions on the external genitalia, inflammations of the urethra and bladder, and diabetic urine. Medicines, even cantharides, have very little, if any, such effect. Nymphomania may result from masturbation and sexual causes, as well as cause them. Some cases of nymphomania assume a periodic form. Vangrado speaks of a woman who, although chaste, was seized with excessive sexual passion in the intervals between pregnan-

52

cies, and became lascivious beyond expression, but when pregnant there was a total suspension of her erotic desires. Sometimes nymphomania is developed from a sudden cessation of normal coitus, in women of a highly erotic temperament. The gynæcologist at times comes in contact with women who show a fondness for gynæcological examinations. Various subterfuges are resorted to by them to induce a handling of their sexual organs. Cases calling for a frequent and unnecessary use of the catheter are instances in point.

In most cases where accusations of rape while under the influence of an anæsthetic have been brought against physicians, no doubt the women believed that they had been so violated. Not only, however, should the former life of the accusing party be considered, but also the well-known medico-legal fact should be recognized that such erotic symptoms may be developed by the anæsthetic itself.

Treatment.—The best results are obtained by moral suasion, by good and thorough occupation, by diversion, and by free physical exercise in the open air, to the point of fatigue. Early rising, cold bathing, regulation of the bowels, the use of a plain but nutritious diet, and the internal administration of the bromides are the best remedies. When local diseases are suspected, search for them, and remedy them by appropriate treatment. Marriage is contra-indicated until a cure has been effected. Clitoridectomy, though seemingly justified, is only exceptionally beneficial. Oöphorectomy, having almost invariably failed to give relief, is unwarranted. Experience teaches that the removal of the ovaries does not always impair sexual desire, but that the female is permanently sterilized. Dependent as this disease almost always is upon some faulty mental or cerebral conditions, inherited or acquired, treatment should be addressed chiefly to their relief.

PERVERTED SEXUAL APPETITE.

Most women are passive, not active, in sexual intercourse. Women, sexually speaking, may be divided into three classes. With most women coitus is at first not pleasurable, but if the sexual organs remain healthy during married life the performance of the act gradually becomes less distasteful, and is enjoyed, at least at times, if not too frequently indulged in, by virtue of a love for, or a sense of duty to, the husband. A large number of women never experience a sexual impulse impelling them to the act; to them the sexual orgasm is unknown. Another class of women are, like men, active and aggressive for sexual gratification, and they suffer if there is sexual continence. Such an active sexual passion may be acquired by a perfectly virtuous woman.

The relative proportion of these three classes stands very much in the order mentioned. Colored women enjoy sexual intercourse more fervently than do their Caucasian sisters, and there are doubtless differences in this respect in women of different nationalities. The great majority of women who take to a life of prostitution do so not for sexual enjoyment, but from

mercenary motives, love of idleness, fondness for ease, and a desire for display in dress. Sexual passion is not so great in females as in males. Many women fall into perverted sexual habits for the purpose of pandering to a patron. Sexual feeling, unknown to most women until marriage, may be unduly exercised and stimulated. It is then an acquired faculty, which is greatly perverted. Sexual continence, enforced by the death of a husband, after the free exercise of the sexual function during married life, is at times followed by unpleasant results. Sexual excesses are borne better by most women than by men, because of their inherent passivity.

Dyspareunia, painful or unpleasant coition, generally denotes some disease of the vulva, vagina, uterus, ovaries, or parametric tissues. While diseases of these parts generally cause dyspareunia, the opposite state, that of an abnormally strong sexual appetite, may result from them. Sexual perversion may be either congenital or acquired. It is congenital when it arises from defects in the sexual structure—hermaphrodism—or from some defect in the cerebral structure, as idiocy. It is acquired from pregnancy, the menopause, hysteria, ovarian disease, or through a stimulation of the nerves of sexual sensibility from sexual excesses or masturbation. It may be acquired from some cerebral disease. Heredity also constitutes an element in causation. Few bodily attributes are more readily transmitted to posterity than certain peculiarities of the sexual system.

Insanity, as has been stated, is very frequently attended by perverted sexual impulses. These sensations may be the symptoms of some local disease; more frequently they are cerebral in origin, existing when the former life has been pure and when there is no local disease.

Masturbation from erotic desires is practised much less frequently by girls and women than by boys and men. When it is indulged in by the female, it is, as a rule, the result of some local reflex irritation of the sexual or genito-urinary organs. Pruritus is a very frequent underlying pathological condition favoring masturbation.

VAGINISMUS.

We owe much to Marion Sims for our first knowledge of this disease. Vaginismus is an abnormal contraction of the muscles of the pelvic floor. It is not a disease *per se*, but a symptom of various morbid conditions of the vulva, the vagina, and the surrounding parts.

Formerly it was supposed to involve the sphincter vaginæ only, but now it is understood to concern also the levator ani, the transversus perinæi, and the bulbo-cavernosus muscles. These muscles are abnormally irritable, and the reflex contraction occurs in them as a result of the following diseases: urethral caruncle; vulvar inflammation, erosion, and fissures; vaginal inflammation and erosion; inflammation and fissures of the hymen, with irritable caruncles; rectal fissures; cervical lacerations; uterine displacements, as retroversion and retroflexion; ovarian prolapsus; periuterine inflammation and exudations.

The diseased area is irritated by coitus, by digital touch, or by the use of the probe, and a reflex muscular spasm is evoked. Patients are always nervous, irritable, hysterical, subject to neuralgia, and easily depressed mentally. Sexual intercourse is always painful, generally very much so, and it may be impracticable. There is usually a neurotic dysmenorrhœa. Vesical and rectal irritability are very commonly present.

Generally only the lower portion of the vagina is involved, but its upper part may be solely affected, not only making coitus painful, but also causing a speedy and forcible expulsion of the seminal fluid from the vagina thereafter. In this form of vaginismus, which is not very uncommon, the levator ani is mostly involved.

Although not severe at the start, quite often, from motives of modesty, vaginismus is allowed to continue unrelieved until it causes severe suffering and much mental anxiety. Nevertheless it can be speedily controlled.

Treatment.—All attempts at sexual intercourse should be absolutely prohibited until the local painful areas are removed or healed and the parts have lost their unnatural hyperæsthesia.

The cause of the local irritation is to be removed, to effect a cure. An irritable urethral caruncle or any inflamed and irritable carunculæ myrtiformes are to be excised. An inflamed, hyperæsthetic hymen should be exsected after being ruptured. An irritable fissure of the anus must either be divided by the knife or gradually stretched. Vulvitis and vaginitis should be relieved by appropriate local applications, as boric acid, bismuth subnitrate, and hot-water vaginal injections. Keep the bowels open. Heal any erosions of the vulva or the vagina by the topical use of solutions of silver nitrate, iodoform, or aristol.

When the hymen and carunculæ myrtiformes are dissected away, the borders of the incisions should be stitched together and the parts dressed with iodoform or aristol, so that healing may take place by primary intention. Healing by secondary intention and by the formation of cicatricial tissue leads to local pain and reflex disorders.

Owing to its anæsthetic properties, the topical application of the secondary faradic current of tension with the long fine wire will at a proper time do great good.

Topical applications of solutions of cocaine (from two to five per cent.) are useful for hyperæsthetic conditions of the vulva and vagina, after the local inflammations have been subdued.

The general health should be improved by tonics. Gradual or forcible dilatation of the contracting muscles, or incision, if needed, should be practised. Gradual dilatation is effected by a series of dilators of hard rubber, a larger dilator being used and allowed to remain longer each succeeding day. Forcible dilatation, with the patient under the influence of an anæsthetic, similar to that which is practised for anal fissures, may be done, after which a good-sized hard-rubber dilator should be inserted and allowed to remain for several hours.

The fibres encircling the vaginal orifice may be divided with scissors, on each side, just within the fourchette. The mucous membrane should be united with sutures before a hard-rubber dilator is inserted.

REMOTE EFFECTS OF OÖPHORECTOMY.

As a rule, extirpation of the ovaries stops menstruation. A slight hemorrhagic discharge per vaginam often follows this operation in a few days, due no doubt to the pressure-effects of the ligatures around the ovarian arteries. It ceases spontaneously in a short time. But, while there is generally no return of the menstrual flow, in exceptional cases it recurs at regular or irregular intervals, for the following reasons. Because a third ovary, unsuspected and untouched, remains. Beigel found a third ovary present in eight out of some five hundred post-mortem examinations. Because of failure to remove the whole of both ovaries. Tait's operation —salpingo-oöphorectomy—is more certain to be followed by menstrual cessation than Battey's or Hegar's operation, because in the removal of the uterine appendages by Tait's method the ligature is placed deeper, and a third ovary, if present, or any irregularly situated Graafian follicles, are more apt to be removed. Menstruation may continue irregularly or regularly for a while from force of habit or the law of periodicity. It in time ceases if all the follicles have been extirpated.

Many cases of irregular menstruation after oöphorectomy may be explained by the presence of some diseased condition of the cervix uteri or of the endometrium, or by the presence of some foreign body within the uterine canal.

There could be no more conclusive proof of the presence of remaining Graafian follicles than the fact that pregnancy sometimes occurs after double oöphorectomy. .

So generally does complete removal of both ovaries cause complete cessation of menstruation that we confidently look for it. Hence we may with perfect propriety and justifiability perform this operation for the removal of certain organic diseases of the ovaries, with their resulting symptoms, and for the arrest of uncontrollable hemorrhages from fibroid tumors of the uterus not too large in size.

This operation has been performed also for many other pelvic diseases, and for nervous and mental disorders seemingly dependent upon, or aggravated by, a functional activity of the ovaries. Thus, it has been done for hysteria, menstrual epilepsy, hystero-epilepsy, nymphomania, chorea, the various forms of insanity, dysmenorrhœa, and pelvic pain indescribable and ill defined in character and position. The actual condition of the ovary, unfortunately, has not always been accurately determined. Just here oöphorectomy has been greatly abused. Battey's operation may be needed to bring about a premature change of life. Hegar's or Tait's operation may be justifiable in cases of organic disease of the ovary or ovaries and tubes which cannot be otherwise controlled. But the author

contends that oöphorectomy has been more abused than any other operation in the domain of gynæcological surgery, because resorted to for ill-defined symptoms which were not altogether dependent upon ovarian functional activity or disease. When there is no organic change in the ovaries and has never been any, oöphorectomy is almost always contra-indicated. Cystic changes in these organs are very common; for the most part they are purely physiological. We should not be deceived by their appearance. That a recovery follows oöphorectomy proves only that the patient has survived the operation; it does not prove that she has recovered from the disease for which the operation was performed. Even if good results follow an operation, we should bear in mind the curative effects of surgical procedures *per se*,—the psychical influence produced on the body by a strong mental impression. Reflex action, through revulsion and counter-irritation, sometimes does good. The *post hoc* is not always the *propter hoc*. Hundreds, if not thousands, of women have had their ovaries needlessly sacrificed. Doléris several years ago said that in four out of every five cases of oöphorectomy done in Paris the operation was unnecessary. More careful consideration and a well-rounded treatment for women would save numbers of ovaries and tubes. Some women, chiefly prostitutes, have asked for the extirpation of their ovaries, to prevent the possibility of impregnation. Pain and dysmenorrhœa are not sufficient indications for female castration. With Hegar and Winckel, I believe that the gynæcologist should not venture on so radical a step unless the case demonstrates to his complete satisfaction the existence of some organic ovarian disease. Many symptoms supposed to be due to organic changes in the ovary are due to obscure peri-oöphoritis or to ovarian neuralgia. In a few of the cases in which the operation has been done the patients have been made worse, rather than better. Oöphorectomy is a comparatively safe surgical procedure. When properly done in selected cases relief is sometimes very speedy, but in other cases this may not be experienced for a year or more.

Necessity is the only justification for ovarian extirpation.

CHAPTER XVI.

DISEASES OF THE URETHRA, BLADDER, AND URETERS.

BY CHARLES JEWETT, M.D., Sc.D., AND JOHN O. POLAK, M.D.

THE URETHRA.

Anatomy.—The inferior three-fourths of the urethra is embedded in the anterior vaginal wall, the upper fourth is separated from the vagina by an intermediate layer of cellular tissue. In its average normal position it courses backward and upward in a general direction nearly parallel with the pelvic brim. Its shape, however, is slightly curved, with its concavity toward the symphysis. Its inferior or anterior portion lies immediately beneath the pubic arch, suspended by the pubo-vesical ligament. Its relation to the superior and inferior triangular ligaments is similar to that in the male. The inferior opening of the urethra, the meatus urinarius, is situated in the median line at the lower margin of the vestibule, its posterior or superior orifice at the neck of the bladder. The average length of the urethra is one inch and three-eighths, and when not overstretched its diameter is about one-fourth inch, but it admits of considerable distention. The urethra when at rest is a closed tube. According to Henle, its cross-section at a point near the meatus presents an antero-posterior slit, near its vesical end a transverse slit, and in the intermediate portion is stellate, owing to the arrangement of the mucous membrane in longitudinal folds. These mucous folds, however, frequently extend to the meatus, giving it a puckered or star-like appearance. Sometimes this orifice is round.

The urethra has a mucous and two muscular coats. The mucosa, as already stated, is disposed in longitudinal folds. The epithelium of the lower portion of the urethra is of the squamous variety, that of the upper portion is partly of the cylindrical and partly of the pavement form. The mucous surface is studded with papillæ, and near the external orifice are numerous lacunæ. The urethral glands are most abundant near the meatus. The basement membrane is composed of fibrillar connective tissue richly supplied with elastic fibres. The submucous coat, not distinctly separated from the mucosa, contains a dense net-work of veins, giving it the character of cavernous tissue. The muscular coat is arranged in an inner longitudinal and an outer circular layer. The innermost fibres are smooth, the outer, in part, of the voluntary striated variety. The latter act as a

sphincter for the bladder; a similar function is performed by the compressor urethræ muscle between the layers of the triangular ligament. The muscular coat of the canal is enclosed by a fascia.

Just within the external orifice of the urethra are two glandular tubules. Skene, who first discovered them, describes them as follows: " Upon each side, near the floor of the female urethra, there are two tubules large enough to admit a No. 1 probe of the French scale. They extend from the meatus urinarius upward from three-eighths to three-fourths of an inch, running parallel with the long axis of the canal. They are located beneath the mucous membrane in the muscular walls of the urethra." The mouths of these tubules are found upon the free surface of the mucosa, within the labia of the meatus urinarius. The location of the openings is subject to slight variations according to the condition and form of the meatus. In some subjects, especially the young and the very old, and in those in whom the meatus is small and does not project above the plane of the vestibule, the orifices are found about one-eighth of an inch within the outer border of the meatus. When the mucous membrane of the meatus is thickened and relaxed, so as to become slightly prolapsed, or when the meatus is inverted, the openings are exposed to view upon each side of the entrance to the urethra. The upper ends of the tubules terminate in a number of divisions, which branch off into the muscular walls of the urethra.

MALFORMATIONS OF THE URETHRA.

Atresia urethræ is a rare congenital defect. Most frequently it is due to a transverse membranous septum. Sometimes the urethra is reduced to a tendinous cord in a portion of its course or through its whole extent. The urine may be evacuated at the umbilicus through a pervious urachus, or it may escape by some other abnormal channel. When no exit exists, the bladder becomes distended during intra-uterine life by accumulation of urine. This condition usually renders the fœtus non-viable, and is liable seriously to complicate delivery.

In hypospadias, the lower or anterior portion of the urethra is either wholly absent or in its place there is a groove representing the upper urethral wall. The urethra thus opens at some point upon the anterior vaginal wall.

A case of bifurcation of the urethra is described by Fürst. From a point one-tenth inch below its vesical end the urethra was double. The two canals opened into the vagina at points about one-tenth inch apart.

Treatment of Atresia.—Urethral atresia with imperforate bladder is seldom amenable to treatment; the malformed fœtus generally dies during delivery or soon after. In a few instances the life of the child has been saved by the establishment of an artificial canal by puncture in the direction of the absent urethra or in the suprapubic region. Cases of atresia urethræ with urachal fistula have been successfully treated by ligating

the umbilical excrescence and constructing a canal to supply the missing portion of the urethra.   A mere membranous septum should be perforated.

When only the inferior portion of the urethra is absent, the defect may be remedied by a plastic operation.   Flaps are formed by longitudinal incisions one on either side of the median line.   Their edges are dissected up and turned in towards each other in such a manner that the epithelial surface of the flaps shall form the lining of the canal.   The channel thus constructed is made continuous with the existing portion of the urethra above.   The flaps should be somewhat larger than are apparently needed, to allow for subsequent contraction.   A sound should be occasionally passed for a time, to counteract the tendency to narrowing.

DISEASES OF THE URETHRA.

Urethritis.—Urethritis is in the great majority of cases of gonorrhœal origin.   Simple urethritis, while comparatively infrequent, may occur from a variety of causes.   Among these may be mentioned prolonged and unsatisfied sexual excitement, the irritating effects of concentrated urine or septic vaginal discharges, chemical irritants, and mechanical injuries.   Exceptionally urethral catarrh may occur as a complication of one of the exanthematous diseases.

Recent writers agree almost unanimously concerning the frequency of gonorrhœal urethritis, and that it is never absent in cases of recent infection of the vulvo-vaginal tract.   Zeissl, however, maintains that there are only five cases of urethral blennorrhœa to a hundred of gonorrhœal vaginitis. This difference of opinion is probably to be attributed to the fact that in many instances the acute stage is mild and of short duration, and that chronic urethritis in the female may easily be overlooked.   The period of incubation in the specific form is from two to five days.

Symptoms.—Urethritis begins in sensitive patients with slight chilliness, malaise, and moderate burning and tickling upon urination, for several days. These symptoms are frequently ignored or overlooked.   The prominent symptom in the acute stage is painful urination.   Scalding and burning are caused by the passage of the urine over the inflamed mucous membrane. There is also frequent desire to urinate.   In occasional cases a few drops of blood escape during or immediately after micturition.   In hemorrhage proceeding from the urethra the blood is not intimately mixed with the urinary secretions, as is usually the case in hemorrhage from other portions of the urinary tract.   In non-specific urethritis the manifestations are of a milder character, and it usually runs its course in a few days.   The gonorrhœal form lasts about six weeks, the acute symptoms subsiding in from ten to fourteen days.   Disease in Skene's follicles runs a slow course, persisting long after all other manifestations have ceased.

Diagnosis.—In acute urethritis the meatus is swollen, reddened, and the urethral mucous membrane somewhat prolapsed, exposing the inflamed orifices of the urethral glands.   Per vaginam the urethra is felt as a firm

cord, tender to the touch. In any stage, by pressure through the vagina upon the urethra from above downward, except when the patient has voided urine immediately before, a purulent fluid can be pressed from the meatus. In the specific form the microscope will generally reveal the presence of the gonococcus.

Neisser contends that the microscopical examination for the coccus is at present the best and only strictly reliable diagnostic method. The cocci are to be looked for in urethral or vaginal mucus, in the urine, or upon threads which have been left for a short time in the vagina. The non-specific character of the inflammation can be established only after repeated and skilled examinations have failed to demonstrate the presence of the gonococcus.

If the patient voids a portion of the urine into one vessel and the remainder into another, during the acute stage, cloudy urine will be found in the first vessel, clear urine in the second; cloudiness of the second urine indicates cystitis.

In the female, gonorrhœal urethritis frequently passes into the chronic stage. In chronic urethritis there are no subjective symptoms, the diagnosis depending wholly upon physical examination. The patient not having urinated for several hours, a drop of thin, milky muco-pus may be obtained by pressure upon the urethra from behind forward. Urine passed after observing the precaution to cleanse the vulva will be found cloudy and containing shreds of mucus. The endoscope reveals the usual appearances of inflammation.

Treatment.—The treatment in acute urethritis, whether of specific origin or not, is conducted on the same general plan. It consists essentially in rest, a non-stimulating diet, the use of alkaline drinks, hot vaginal douches, warm sitz baths, and saline laxatives. In the subacute and chronic stages the oil of sandal-wood (ten minims every four hours) will be of service. The drug should be pure, and is best given in capsules. Salol, in doses of five grains every three hours, is useful, and is sometimes better borne than the sandal-wood oil.

Authorities differ as to the proper time to begin urethral injections. Most writers advise waiting till pain and smarting have nearly ceased. Neisser, on the other hand, begins in acute cases at the outset. He employs injections of nitrate of silver (1 to 4000), repeated four to six times daily. During convalescence the frequency is reduced to once a day. For the first few days after beginning this treatment the discharge is increased; it then becomes watery and contains more epithelium, the gonococci rapidly disappearing. This plan of treatment is also endorsed by Guyon. The injections are made when the bladder is moderately full, with an ordinary urethral syringe, a pipette, or Skene's reflux catheter, which is adapted for urethral irrigation. The bladder should always contain urine, in order to prevent direct action of the injection-fluid upon the walls of that organ. Great benefit is derived from douching the urethra two or three times a day

with water as hot as the patient can bear, using the reflux fluted catheter (Skene) with a fountain syringe attached. In subacute or chronic cases this may be followed by an injection of sulphate of zinc (gr. $\frac{1}{2}$ to gr. ii ad ʒi), or by the use of a urethral suppository of iodoform (gr. x) in cacao butter.

FIG. 1.

Skene's reflux catheter.

Ichthyol diluted with an equal volume of water is warmly praised as a local application.

J. William White recommends reflux urethral irrigation with gradually increasing strengths of nitrate of silver, beginning with one-half grain to the drachm, followed by gradually strengthened solutions of sulpho-carbolate of zinc. Weisse passes an elastic or metallic catheter into the bladder, and, after withdrawing the contents, injects into it, by means of the irrigator, zinc sulphate, two to three parts, tannin, five-tenths part, in five hundred parts of water, at a temperature of 26° R. (90° F.) The catheter is then withdrawn and the patient directed to empty the bladder. Granular erosions yield to local applications of nitrate of silver. Particularly good results are obtained by daily applications of a two- to five-per-cent. solution of nitrate of silver through a short endoscope, by means of applicators, which are easily made of smooth, narrow strips of wood wrapped with cotton.

Gradual dilatation with bougies is applicable to certain cases where hyperplasia of the walls has caused contraction of the canal to a greater or less degree.

In chronic cases with persistent suppuration in Skene's glands, these tubules must be laid open by slitting them up on the urethral surface and touching them with strong tincture of iodine or a solution of perchloride of iron.

Stricture of the Urethra.—Urethral coarctations are far less frequent in the female than in the male; they are for the most part acquired, congenital narrowing being extremely rare. Strictures of a high grade are of very exceptional occurrence. The causes of cicatricial contraction are chronic urethritis, most frequently gonorrhœal, injuries during childbirth and other forms of traumatism, caustic applications, and ulcers of syphilitic or tuberculous origin. Atresia may arise from atrophy of the muscular coats.

Symptoms.—A history of injury during labor or of urethritis is sometimes obtainable. Irritability of the bladder and dysuria are usually the most prominent symptoms. Rarely there is incontinence or partial retention, which may give rise to cystitis.

Diagnosis.—Digital examination per vaginam will reveal more or less thickening and induration of the urethra at the strictured point. Cicatrices may be felt in the urethro-vaginal septum. The existence of stricture, too, is easily demonstrated and its location determined, as in the male, by a bulbous sound. Obstruction from pressure upon the urethra by pelvic neoplasms or from urethral dislocations may be confounded with stricture, but these conditions are readily distinguished from cicatricial contraction.

Prognosis.—In general, under proper treatment, the prognosis is good. In long-standing cases in which dilatation of the urethra or chronic cystitis has been established, while much may be done for the amelioration of the condition, complete recovery is seldom possible.

Treatment.—As a rule, the most satisfactory method of treatment is gradual dilatation as practised in stricture of the male urethra. A series of graduated dilators similar to those used by Kelly in dilating the urethra for diagnostic purposes may be used. Instruments should be sterile, and the urethral canal carefully cleansed before they are passed. Care must be taken to prevent laceration of the urethral mucosa, and the dilatation ought not to be carried far enough to cause permanent incontinence. The largest sound should never exceed sixty millimetres in circumference. Dense cicatricial bands which do not yield to the foregoing treatment may be incised with a dilating urethrotome after the method of Otis, as practised in stricture of the male urethra. The normal calibre of the urethra is then maintained by passing a full-sized sound at intervals of several days till the incision has healed. When the urethral obstruction depends on a constricting band of scar-tissue in the anterior vaginal wall, the cicatrix should be divided by multiple transverse incisions on the vaginal surface and subsequent contraction prevented by the use of the sound.

Prolapse of the Urethral Mucous Membrane.—Prolapse of the urethral mucous membrane sufficient to cause a marked protrusion at the meatus is rare. Slight ectropion is by no means uncommon. The process of eversion is usually a gradual one; acute prolapse is, however, possible. The prolapse generally involves the entire margin of the meatus; exceptionally it is limited to a portion of it. In recent prolapse the surface of the tumor differs little in appearance from the normal mucous membrane. In long-standing cases the protruding mass may become dark, œdematous, fissured, eroded.

Hofmeier observes that this affection is most frequently met with in young debilitated women. He mentions, however, two cases which occurred in children seven and nine years of age respectively. Portions of the prolapsed tumors microscopically examined by Ruge revealed a very vascular structure, consisting of widely dilated vessels set closely together, rather than a true primary prolapse of the urethral mucous membrane. Södermark has reported three cases, two of which occurred in old women, aged fifty-eight and seventy years respectively, while the third was found in a child of nine years.

The following cases recently published by Bagot, of Denver, Colorado, are of interest:

CASE I.[1]—A woman, aged thirty-three years, came to the Rotunda Hospital, April, 1889, stating that there was a swelling at the orifice of her vagina, from which a discharge was running, and that for the past week she suffered from intense pain on walking and during micturition. She had been delivered of her second child about four weeks and five days previous to this, and there had been nothing abnormal about her labor, but during the puerperium she had suffered from a slight attack of endometritis. On examination, a small dark-red tumor about the size of a walnut was found projecting from the vestibule. The central and most prominent portion of the tumor was sloughing, and in the middle of the sloughing mass the external orifice of the urethra was found, through which a sound was easily passed into the bladder. The tumor was simply dusted over with iodoform and the patient kept in bed. She was discharged in four weeks, the tumor having sloughed off in a day or two after admission, a spontaneous cure thus being brought about.

CASE II.—A child, five years of age. She had been suffering from pain during micturition for the past five weeks; her under-linen was constantly stained by a sanious discharge. Examination revealed a tumor of bright-red color, about the size of a large cherry; it was found projecting from the vestibule and filling up the vulvar orifice. The external meatus of the urethra, situated in the centre of the tumor, was dilated and funnel-shaped, resembling very much the ostium of a Fallopian tube greatly hypertrophied and swollen. The tumor bled easily when touched. The growth was removed with the scalpel, and the urethral mucous membrane stitched to the external mucosa with interrupted silk sutures. Recovery.

FIG. 2.

Prolapse of urethral mucous membrane in a child. (Bagot.)

CASE III.—A child, seven years of age, had been suffering from hæmaturia for some days. Examination demonstrated a dark-red or purple tumor, about the size of a cherry, projecting from the vestibule, the meatus being situated a little below the centre of it. It bled easily when touched, and on inquiry it was found that the child had from time to time suffered from hemorrhages, but had at no time complained of pain. The same procedure was adopted as in Case II., with entire success. (Fig. 2.)

Etiology.—A relaxed condition of the urethra, together with a loose

----

[1] Dublin Journal of the Medical Sciences, September, 1891.

attachment of its mucous membrane to the submucous structures, is generally assumed as a predisposing cause of the prolapse. Age and debility undoubtedly favor its development.

Vesical or rectal tenesmus of whatever origin, and, in children, violent and prolonged paroxysms of coughing, are regarded as exciting causes.

Bagot observes that in the cases reported by him the results of microscopical examination went to confirm the opinion that cases which are commonly described as complete prolapse of the urethral mucous membrane are rarely, if ever, instances of true primary prolapse, but that the prolapse of the mucous membrane is secondary to some neoplastic change in it, the most usual being, according to the investigations of Ruge and Martin, angioma.

Symptoms.—Vesical tenesmus and dysuria are marked in proportion to the degree of obstruction and the sensitiveness and irritability of the urethra and the displaced structures. Soreness and pain are increased on walking, and coitus is frequently painful. Pain, however, is not always present, especially in children.

Diagnosis.—When the displaced mucous membrane is not too much strangulated and swollen, mere prolapse may usually be distinguished from new growths by the fact that it may be replaced. The reduction of the tumor should be attempted with the patient in the lithotomy position. Again, urethral prolapse generally appears as a circular protrusion with a central opening. The tumor is of a less vivid color, is less prone to bleed, and is less sensitive to the touch, than caruncle.

Treatment.—In recent cases, and in others in which the prolapsed structures are in a comparatively healthy condition, simple measures may be tried. The protruding mass should be replaced, after reducing the swelling by applications of hot water or ice. After repositing the redundant mucous membrane, retraction of the urethral canal is to be promoted by the use of suitable applications, such as touching daily with a two-per-cent. carbolic acid solution or dilute tincture of iodine. Tannic acid bougies, weak solutions of persulphate of iron, or other astringent remedies may be tried. Meantime the patient must be kept in the recumbent posture and care used to guard against recurrence of the prolapse during micturition. Vesical or rectal tenesmus must, so far as possible, be relieved. The bladder should be examined for the possible presence of stone or vesical tumors.

These means failing, or being obviously inadequate, recourse must be had to more active measures. The writers have succeeded with linear cauterization of the prolapsed membrane. The fine point of a Paquelin cautery is used at a dull-red heat, three or four applications being made in a line with the axis of the canal and at equal distances about the circumference.

Excision of the redundant tissue is frequently necessary. After removal with the knife or scissors, the urethral mucous membrane is stitched to the margin of the orifice with fine sutures. Subsequent dilatation of the meatus may be necessary to counteract cicatricial contraction.

Vesico-Urethral Fissure.—Skene says that this lesion is by no means infrequently met with in the female. Reginald Harrison and Spiegelberg have recognized and described a similar condition in the posterior urethra and neck of the bladder in the male. In 1882, Harrison called attention to the condition sometimes found at the neck of the bladder after death, consisting in a crack or fissure of the mucous membrane, produced by ulceration commencing in the posterior urethra and involving the neck of the bladder. About two-thirds of the fissure is located in the urethra, while only the upper portion extends into the vesical neck, yet the entire lesion is within the grasp of the sphincter vesicae in the majority of cases, and is thus a potent cause of irritable bladder which may often pass unrecognized by the physician. The cause of the fissure probably lies in a previous urethritis. Injuries during confinement favor the development of this affection, since repair of lesions within the grasp of the sphincter is seldom possible.

Symptoms.—The symptomatic importance of this lesion depends upon its site. Occurring, as it does, at the union of the bladder and the urethra, and because of the constant slight pressure by sphincteric contraction, the pain is continuous and severe. The upper portion of the fissure, which extends into the bladder, is exposed to the irritation of the urine, and excites a constant burning pain at the neck of the bladder. Pain is most severe during and after urination, and the patient strains to empty the bladder. Occasionally a few drops of blood escape at the end of micturition. The pain varies in degree, in some cases being intense when the urine is highly acid and less severe when it is neutral or alkaline.

Diagnosis.—Pressure with the finger upon the neck of the bladder and posterior urethra produces a sensation as though a knife were piercing the part. The symptoms of cystitis and urethritis very closely simulate those of urethro-vesical fissure. In fissure, however, the pain is acute and circumscribed, while in cystitis it is diffuse and frequently extends over the body of the bladder. In fissure, urination is followed by the maximum degree of pain, while in cystitis a sense of relief soon follows micturition. In urethritis the greatest pain occurs during micturition, and subsides shortly after the bladder is emptied. Examination of the urine will exclude cystitis, while the presence of fissure can be detected and urethritis excluded by careful endoscopic examination.

In a majority of the cases observed by him, Skene has found the fissure on the right side of the neck anteriorly. Through the endoscope, with the parts on the stretch, it appears as freshly torn and bleeding, from one-fourth to one-half inch in length, and from one-twelfth to one-sixth inch in width, tapering towards the ends. The deepest part has a gray color, like an indolent ulcer, while the edges appear actively inflamed.

Treatment.—This is one of the most troublesome affections of the urinary tract which the surgeon is called upon to treat. Injections of various remedial agents in different strengths are not only useless, but even seem

to increase the tenesmus and other distressing symptoms. Direct applications of strong caustics, the actual cautery, or free linear incision with the knife, the fissure being exposed by the endoscope, yield reasonably good results. Dilatation of the urethra with sounds gradually increasing in size gives great relief. Before treatment by incising or dilating, salol, in doses of a drachm daily, should be administered for a few days for its antiseptic effect upon the urine.

FIG. 3.

Skene's urethral speculum.

Skene, in a recent paper,[1] recommends touching the fissure with the galvano-cautery. The method, however, is difficult of execution. When the fissure is on the vaginal side of the urethra, he uses a fenestrated endoscope, bringing the fissure into the field of vision. (Fig. 4.) He makes pressure upon the endoscope from the vagina with the finger, which forces the diseased portion of the mucous membrane into the fenestra and prevents the overflow of urine. He then dries it with a

FIG. 4.

Skene's fenestrated endoscope.

small piece of bibulous paper and applies the cautery by simply drawing the point slowly through the ulcer, so as completely to destroy its surface. To a certain extent, lateral fissures can be managed in the same way, but when the fissure occurs above, which, fortunately, seldom happens, it is almost impossible to employ this treatment. The knife and argentic nitrate in the mitigated stick are applied in a similar manner through the fenestra of the endoscope.

When the foregoing methods fail, the establishment of a vesico-vaginal fistula, placing the fissure at rest, offers the only chance of recovery.

Urethrocele.—Urethrocele is a sacculation of the middle portion of the urethra. It consists most frequently in a bagging of the inferior wall, the upper wall deviating little, if at all, from its normal position. Less often it is a diverticulum with a more or less constricted orifice. The tumor may attain a diameter of five or six centimetres.

Etiology.—The etiology of urethrocele is not settled. That injuries inflicted during childbirth have much to do with the etiology of simple dilatation is rendered probable by the fact that this lesion is most commonly met with in women who have borne children.

Obstruction by organic stricture, and consequent dilatation of the urethra immediately behind the stricture by reason of the impeded flow of urine, have been assumed as causes. As a fact, however, stricture and urethral dilatation seldom coexist. According to Englisch, the diver-

---

[1] Transactions of the New York Obstetrical Society, 1892.

ticular form results from the rupture of a congenital cyst of the urethral wall into the urethral canal.

Symptoms.—The symptoms of urethrocele are for the most part due directly or indirectly to the retention of a certain amount of urine in the sac. The residual urine becomes ammoniacal by decomposition and finally purulent. The sac-wall becomes inflamed and eroded. The ammoniacal urine causes urethritis; cystitis sometimes results from extension into the bladder. In many cases decomposed urine is expelled from the sac on sneezing, coughing, laughing, or other sudden muscular effort, giving rise to severe and troublesome excoriations of the surrounding external surfaces. There is frequent desire to urinate, and urination is painful. In case of the diverticular form of urethrocele with a very small orifice, so little residual urine may escape from the sac on micturition as to cause but little urethritis and little or no inconvenience.

Diagnosis.—Sacculation of the urethra is perceptible to the touch per vaginam and to ocular inspection of the anterior vaginal wall. When the pouch is of large size, it protrudes from the vulva. The retention of urine in the sac may be demonstrated by drawing it off with a catheter. Under pressure with the finger the sac collapses and the contents ooze from the meatus. On examination with the endoscope, the walls of the urethrocele are found inflamed and frequently eroded and covered with granulations. The existence of the pouch is also established by passing a curved sound into the pocket per urethram. The difficulty with which the sound enters the mouth of the sac and the globular expansion beyond serves to distinguish a diverticulum from simple dilatation. A periurethral abscess which has ruptured into the canal is differentiated by the history, and by the induration of the surrounding structures.

Treatment.—The plan of treatment will depend upon the form of the urethrocele and the degree of attending inflammation in the urethra and bladder. If the sac be of the diverticular variety, with little attending urethritis, it may be wholly excised and the resulting fistula closed by suture.

Fig. 5.

Skene's button-hole scissors.

In the presence of much urethritis, the opening remaining after excision of the sac should be left unclosed, to facilitate drainage and the use of remedial applications. The diffuse form is best treated by Bozeman's method of incision of the most dependent portion of the sac. A convenient instrument

for the purpose is Skene's button-hole scissors (Fig. 5), or the Paquelin cautery knife may be used, cutting down upon a sound previously passed into the urethra. The urethritis is to be treated by the usual methods. After the parts have been restored to a comparatively healthy condition the fistula may be closed, with care to remove first any remaining redundant tissue. Cystitis, if present, is to be treated as in other cases. In moderate diffuse sacculation of the urethra with but little accompanying urethrocele, Skene advises dilating the lower part of the urethra and supporting the sacculated portion either with a pessary or with a tampon, together with the use of the usual topical applications.

Urethral Dislocations.—The only urethral dislocations of special clinical importance are downward displacements. Upward dislocation, as a rule, gives rise to no symptoms, save difficulty in passing the catheter. In downward displacement, on the contrary, varying degrees of suffering are experienced by the patient. The displacement may be partial or complete. In partial dislocation downward the "upper two-thirds of the urethra is prolapsed, that portion of the canal having a backward instead of an upward direction." When the prolapse is complete the bladder presents at the vulva, with the urethra protruding between the labia minora. A case is reported in which the bladder and the urethra lay between the thighs.

Etiology.—Downward dislocation of the urethra is invariably associated with prolapse of the anterior wall of the vagina. These conditions are almost uniformly the result of injuries during childbirth, sagging of the anterior vaginal wall occurring in perineal lacerations involving the levator ani muscle. The bladder or the upper portion of the urethra is thus permitted to fall below its normal position. The severer grades of urethral prolapse are possible only when the urethra has been partly torn from its supports.

Symptoms.—In minor degrees of displacement there are vesical irritability and partial loss of control of the bladder; urine escapes on coughing, sneezing, or laughing. In extreme displacement this unpleasant symptom is absent; the sharp bend in the urethra prevents incontinence, and difficult urination is the rule. The severity of the symptoms is much relieved by the recumbent position.

Diagnosis.—The diagnosis is readily made by a digital examination per vaginam or by inspection with the aid of a Sims speculum. Downward projection of at least a part of the urethra into the vagina will be observed.

Prognosis.—Under proper treatment, the prognosis is favorable in recent cases. After long-standing prolapse, restoration is difficult or impossible, owing to the development of structural changes.

Treatment.—As suggested by Skene, from whose work the foregoing facts have been largely drawn, the curative treatment must be addressed to the cause. Perineal injuries should be repaired, with a view to restoring the natural supports of the anterior vaginal wall. Temporary relief, with some degree of permanent benefit, may be gained by the use of vaginal

tampons or the employment of a pessary so constructed as to support the entire prolapsed portion of the urethra.

Fistulæ.—Urethral fistulæ may be complete or incomplete; both forms, and especially the latter, are of rare occurrence. Complete fistulæ of the urethra open into the vagina; they result usually from injuries during childbirth. They give rise to comparatively little incontinence, as the urine is discharged through the fistula only during micturition. The method of procedure for the closure of complete urethral fistulæ differs in no respect from that employed in vesico-vaginal fistulæ, which will be found described under the treatment of the latter affection.

Incomplete urethral fistula is an opening leading from the urethra into the urethro-vaginal septum and ending in a blind extremity. A periurethral abscess rupturing into the urethra may leave such a fistulous tract. Rarely, cysts of the urethro-vaginal septum rupture into the urethra and cause this incomplete variety of fistula.

Diagnosis.—Pain during urination and a sense of heat in the urethra are common symptoms. A blind fistula in the posterior portion of the canal in the vicinity of the vesical neck gives rise to frequent urination and tenesmus. Pus may at times ooze from the urethra. Smarting during and for some time after urination is almost invariably present.

A history of periurethral inflammation materially aids the diagnosis. Examining by the vagina, the finger will detect thickening and induration of the urethral walls and in the urethro-vaginal septum at the seat of the fistula. Pus can be made to escape from the meatus by pressure from above downward upon the urethra with the finger in the vagina. When the lesion is situated in the floor of the urethra, as it most frequently is, it may be detected by a probe with the point slightly bent. This condition must be distinguished from the diverticular form of urethrocele.

Treatment.—The fistula should be made complete and the edges of the wound carefully denuded. The urethra and the fistulous tract are then to be kept clean by injections into the urethra of a solution of boric acid or some equally bland antiseptic. The urine is drawn with the catheter, to prevent irritating the wound; then the urethro-vaginal fistula may close of its own accord, or it can readily be closed by the usual operative procedure.

TUMORS.

Caruncle.—Caruncle is a small raspberry-like growth at the external orifice of the urethra. Usually it is situated at the inferior portion of the meatus, though it may spring from any part of the circumference. In exceptional cases its location is above the orifice within the canal. These growths vary in size from that of a pin-head to that of a pea, and are usually single, occasionally multiple. They consist of hypertrophied papillæ, and are extremely vascular and abundantly supplied with nerve-filaments. To these growths Winckel has given the name papillary angiomata.

Symptoms.—The most prominent symptoms of urethral caruncle are

exquisite sensitiveness to the touch and extreme pain during micturition; the severity of these symptoms is out of all proportion to the apparent importance of the lesion. Sexual intercourse is painful, frequently impossible, owing to the reflex spasm of the levator ani muscle. There is irritability of the bladder, giving rise to frequent urination and vesical spasm. In extreme cases cystitis may result. There is usually more or less hemorrhage from the tumor, sometimes to the point of exsanguination. Few affections of the urinary tract are capable of causing more serious injury to the general health. In neglected cases the nervous system is shattered by pain and loss of sleep and the patient is reduced to a condition of chronic invalidism.

Diagnosis.—Caruncle must be distinguished from urethral polypi and from prolapse of the urethral mucous membrane. A polypus is usually attached by a slender pedicle, while in papillary angioma the growth is sessile. Moreover, the former lacks the sensitiveness of the latter. In prolapse the protrusion is circular, with the urethral orifice at its centre, while caruncle springs from a portion only of the circumference. The vascular · tumor, too, cannot be reduced. Angiomata in the deeper portion of the urethra may be differentiated from other urethral tumors by their sensitiveness to touch with the probe or to the pressure of the finger through the urethro-vaginal septum.

Varices.—These appear as bundles of irregularly distended, dark-blue or bluish-red vessels, most frequently occupying the urethral floor. Erectility has been observed in some of these vascular neoplasms. Occasionally a varix may rupture beneath the mucous membrane, forming a hæmatoma.

Glandular Neoplasms.—Urethral cysts may be located at any point in the canal. In early life they occur in the meatal portion, later near the vesical neck. Their origin is due for the most part to occlusion of the orifices of urethral glands. These small cysts are transformed into polypi by the absorption of their contents. The rarest form of neoplasm under this head is myxo-adenoma. This is small, vascular, and of a bright scarlet color, consisting of degenerated glandular tissue richly supplied with blood-vessels, the meshes being filled with myxomatous débris, supported by loose connective tissue.

Fibroma and Sarcoma.—The former, as a rule, lies embedded in the muscular wall of the urethra; it is frequently peduncular and protrudes from the meatus. In size fibromata vary from the bulk of a pea to that of a goose-egg. On section they are found to consist of densely packed fibrous tissue covered by stratified epithelium. As a class they are of infrequent occurrence.

Sarcoma of the urethra is so seldom met with that its mere mention in this connection will suffice.

Carcinoma and Epithelioma.—The existence of primary cancer of the urethra is very rare. Reginald Harrison and Mr. Beck each report a case in the male. In the female it is less frequent than in the other sex.

Goodell mentions a case in which the woman suffered severely from urinary obstruction due to cancerous growths in the urethra. The diagnosis is possibly open to doubt, as the patient was soon lost sight of and no microscopical examination was made. Lewers cites a case in a woman forty-nine years of age. She had had three children, the youngest being then fifteen years old. On examination in the situation of the urethral orifice, he found an irregularly-shaped ulcerated cavity admitting the tip of the finger. The walls of the cavity were formed of hard tissue, and the induration extended up the anterior vaginal wall for nearly two inches. The surface of the cavity bled easily on touch. The glands in both groins were involved. This may properly be regarded as a case of extension from the outer genitals. Even secondary malignant diseases by extension from uterus, bladder, or vagina rarely, if ever, reach the urethra before the patient dies.

Several cases have been recorded of periurethral carcinoma at the introitus vulvæ, near the meatus, and in the connective tissue surrounding the urethra.

Symptoms.—Pain is not necessarily present. The most frequent symptom is difficulty of micturition, owing to partial obstruction of the canal.

Polypus.—True polypus of the urethra is of rare occurrence. When present, it springs from a point high up in the canal, usually at the junction of the urethra with the neck of the bladder, and thus may readily escape detection. It is not painful, and gives rise to little trouble, except that sometimes it may cause obstruction to micturition. Goodell advises exploration of the urethra with the finger to confirm the diagnosis. The endoscope will reveal the condition with as much certainty and with less danger.

Treatment of Caruncle.—The use of chemical caustics, such as nitric, chromic, and carbolic acids, is unsatisfactory : the growth, as a rule, soon returns. Even when successful, unnecessary injury is done to the adjacent healthy structures. Total extirpation offers the only hope of permanent relief. This may be effected by excising the diseased structures and stitching together the edges of the healthy mucous membrane of the urethra. The most satisfactory method of extirpating the growth is by actual cautery. Skene recommends the use of the galvano-cautery as follows : " The neoplasm to be removed is seized by a narrow-bladed forceps at the junction of the normal and abnormal tissues, the forceps is closed and locked, and the neoplasm cut off. The cautery is applied to the forceps sufficiently to heat enough to desiccate, not char, the tissues held in its grasp. This being accomplished, the forceps is carefully removed by first unlocking it, then rocking it gently, so as not to pull the pedicle or stump apart and start bleeding. If the work is well done, the thin stump of desiccated tissue will project on the surface of the mucous membrane. The bladder should be emptied before operation, so that there will be no necessity to urinate for five or six hours after. This lessens the danger of reopening the stump, and usually but a small linear surface is left to heal by

granulation after the eschar sloughs.   Applications of sterilized vaseline help to protect the stump while healing.   When the neoplasm arises from a chronic inflammation of Skene's glands, as is sometimes the case, the best method is to pass a fine probe up into the canal and cut down upon it with the fine cautery point from the vaginal surface.   In other words, lay the ducts of the glands open ; this divides the neoplasm on one side, and an incision should be made with the cautery on the opposite side, which divides the growth into two equal parts.   Then each part is grasped with forceps and removed in the manner already described."

Treatment of other Urethral Tumors.—Tumors of a vascular character with a broad base are readily removed by the ligature.   The growth being exposed and drawn into reach with a forceps, the base is transfixed with a needle from without inward in a direction parallel to the axis of the canal ; a ligature is then thrown around the base beneath the transfixing-needle, traction being made upon the tumor with forceps to bring the sides of the base into the grasp of the ligature, which is then tied tightly, care being taken to prevent cutting the tissues in the ligature.

Torsion is applicable in pedunculated neoplasms.   The base of the pedicle is seized with small thin-pointed forceps and the growth is twisted off with an ordinary pair of nasal forceps.   In employing this method it is well to touch the stump of the pedicle with the galvano-cautery, as a safeguard against hemorrhage, before letting go the grasp with the small forceps.

The curette has been utilized, notably by the Germans, for the removal of growths high up in the urethra.   After curettage the site of the tumor is to be dried and seared with the cautery.   Gouley and Skene employ a polypus snare for the removal of growths high up in the canal.   The technique is as follows : " The tumor being exposed with a urethral speculum, if the growth is pedunculated the loop of wire is passed over it and removal effected by constriction ; when there is a broad base the mass is raised with a pair of polypus forceps and the snare is then passed over and tightened."   Care should be taken to avoid breaking the wire.   The use of

Fig. 6.
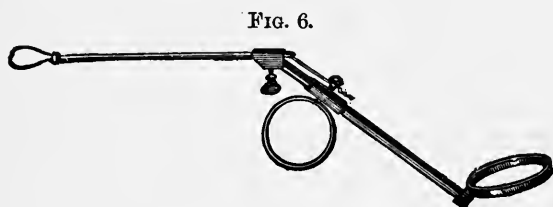
Blake's polypus snare.

the galvano-cautery for the destruction of urethral neoplasms has already been described : its value cannot be too highly estimated.

When the tumors are in the upper part of the canal and the meatus is constricted, gradual dilatation by sounds, or the employment of Simon's method of incisions into the external orifice of the urethra, is necessary before the removal of the neoplasm.   In the latter method one incision is made anteriorly, one-fourth centimetre in depth, the other one-half centi-

metre in depth, posteriorly. If the dilatation is confined to the lower portion of the canal, the growth can be exposed with little or no danger of subsequent incontinence.

The treatment of malignant growths is immediate and complete extirpation with the knife. The excised mass should include a wide margin of the adjoining healthy tissue.

FOREIGN BODIES IN THE URETHRA.

Foreign bodies of various descriptions may find lodgement in the urethra.

Diagnosis.—The symptoms produced depend largely upon the size and character of the foreign body. Partial retention of urine is the chief symptom, accompanied with pain and a spasmodic contraction of both urethra and bladder. If the body be of irregular shape and its surface studded with sharp points, hemorrhage, ulceration, and even periurethral abscess may result. When the obstruction is total, retention, if persistent, may cause serious injury to the ureters and kidneys. The diagnosis is readily established by examining the urethra with the finger in the vagina.

Treatment.—The extraction of a foreign body may be accomplished by seizing it with a pair of long, thin-bladed forceps. The body is held in place by the finger passed per vaginam and pressed against the urethra at a point immediately behind the body during the attempt to engage it in the forceps. Sometimes the body can be removed by means of a wire loop or a smooth spoon curette. Dilatation up to the seat of obstruction and extraction with forceps, loop, or curette has been employed. When the object cannot be readily dislodged by these measures, it may, if friable, after being pushed backward into the bladder, be removed through a Kelly speculum with or without lithotripsy. If this be impracticable, incision of the urethra at the point of obstruction is permissible.

THE BLADDER.

Anatomy.—The urinary bladder is a hollow muscular organ. When empty or moderately filled, it lies entirely below the plane of the pelvic brim, between the pubic bones in front and the uterus and vagina behind. In the infant it is an abdominal organ and is somewhat pear-shaped, the urachus corresponding to the stalk. In old age there is a partial return to the infantile condition. When over-distended, the bladder rises above the line of the pubic bones and is seen as a mesial projection above the symphysis. In extreme cases it may reach to the umbilicus, the female being more distensible than the male organ. In the mature female the transverse diameter is the greater, and the shape of the bladder when partially filled is ovoid, with its long axis directed transversely. The empty bladder is generally described as a collapsed sac, whose cavity, together with the canal of the urethra, appears in sagittal section either as a Y-shaped or an L-shaped

fissure. This opinion is based on the study of frozen sections and the appearances found on the post-mortem table. Morris (Human Anatomy) says, "It is possible that this diastolic form of the empty bladder, as it has been termed, is the normal result of a relaxation preliminary to re-filling, but it appears more probable that it is due to the loss of the vital

Fig. 7.
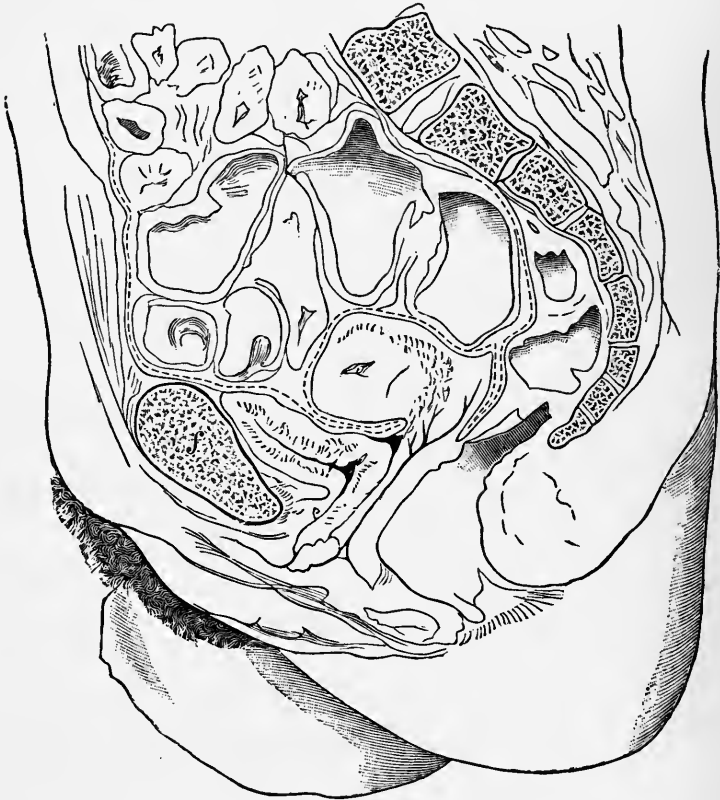
Frozen section of the pelvis, showing empty bladder. (Fürst.)

elasticity of the muscular walls, and that the healthy living bladder always maintains a rounded or ovoid form."

The bladder has three openings,—the ostium urethræ internum and the two ureteric orifices. The former is described below; the latter are situated one on each side of the median line on the floor of the bladder, about three centimetres behind the vesical opening of the urethra and the same distance apart. A transverse band stretching from one to the other is known as the inter-ureteric ligament.

The appearance of the ureteral orifice differs in different cases. As stated by Kelly, "It sometimes appears as a dimple or as a fine slit in the mucous membrane; at others as a ⋀ with the point directed outward. Again, it may present the form of a truncated cone with gently sloping

sides, the ureteral mons. The latter appearance is most apt to be developed in the knee-chest position." These appearances are of interest in connection with ureteral catheterization through the speculum.

The regional divisions of the bladder are: the apex or summit or superior fundus, the body, the base or inferior fundus, and the so-called neck. (Fig. 8.) The summit of the bladder is directed upward and forward and is attached to the urachus. The base is the part which looks downward and backward. The anatomical limits of these regional divisions, however, are not distinctly defined. The trigone is a triangular space at the base of the bladder whose apex is at the ureteral orifice and whose base is the inter-ureteric line. Over this area the mucous membrane is thinner and more closely adherent, having no submucous layer. The nerve-supply to this space is very abundant, and it is accordingly the most sensitive area of the bladder. The apex of the trigone where it merges into the urethra is the so-called vesical neck. The opening of the urethra into the bladder is, however, abrupt, not funnel-shaped, as the term neck might imply. In that part of the base which lies just behind the inter-ureteric line is a slight depression, the bas-fond, which in old age becomes a deep pouch holding residual urine.
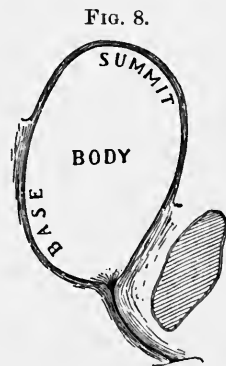
FIG. 8.

Regional divisions of the bladder.

The more important anatomical relations of the bladder are of clinical interest. In the erect posture the anterior inferior surface looks towards the symphysis. It is separated from the pubic bones by a space known as the cavum Retzii. This space contains a variable quantity of loose fat. Each lateral surface is partially covered with peritoneum. The posterior surface is intimately connected below to the cervix uteri and to the upper part of the anterior wall of the vagina, but is separated above from the body of the uterus by the shallow fold of peritoneum, the utero-vesical pouch. The superior surface lies in contact with the small intestines, sometimes also with a portion of the sigmoid flexure and with the appendix vermiformis.

The ligaments of the bladder are five false and five true ligaments. The false ligaments are formed of folds of peritoneum. This is reflected from the inner face of the anterior abdominal wall, at a point just above the symphysis, to the bladder, investing that organ, as has been already shown, superiorly, laterally, and in part posteriorly. It joins the bladder in front, dipping down over the superior vesical surface, and passes as far backward as the point of contact between the vesical base and the uterus at the junction of the uterine body and cervix. · The superior peritoneal fold in front, which extends from the summit of the bladder to the umbilicus, covering the urachus, two utero-vesical folds, and the two lateral folds of peritoneum, constitutes the false ligaments. The true ligaments of the bladder are the

superior (the urachus), two lateral, and two vesico-pubic, the last four being formed of the recto-vesical fascia.

The bladder has three coats,—a mucous, a muscular, and over a part of its surface a serous or peritoneal coat,—the relation of which to the viscus has already been described. The muscular coat consists of three layers, but the innermost is incomplete. The fibres run for the most part in longitudinal and in circular directions; at the neck the circular fibres are collected into a layer of some thickness, which immediately surrounds the upper end of the urethra, forming the so-called sphincter vesicæ of some writers. The mucous membrane is lined by transitional stratified epithelium and is arranged in irregular folds. Throughout the mucous membrane are minute glands and follicles.

The vascular supply of the bladder is derived from the superior, middle, and inferior vesical arteries, and from branches of the uterine, internal, pudic, hemorrhoidal, and sciatic. The veins form tortuous plexuses about the base, sides, and neck, and finally empty into the internal iliac veins. The lymphatic distribution in the submucous cellular tissues of the bladder is quite extensive, the lymph-vessels emptying into the hypogastric glands.

The nerves of the bladder are derived from the third, fourth, and, in rare cases, the second sacral nerves of the spinal system, and from the hypogastric plexus of the sympathetic. The latter plexus is situated in front of the last lumbar and the first sacral vertebra. The branches of the spinal nerves go mainly to the base and neck of the bladder.

MALFORMATIONS OF THE BLADDER.

Congenital defects of the bladder, though of great variety, are of rare occurrence. Two only—exstrophy and double bladder—are of clinical interest.

Exstrophy.—Fissure of the bladder is the most common congenital defect of that organ. It is far more frequent in the male than in the female subject, eighty to ninety per cent. of cases occurring in the former sex. It is associated with partial failure in the closure of the ventral laminæ. It consists in a cleft, often an entire absence, of the anterior wall of the bladder and a median fissure of the anterior abdominal wall. Like other anomalies of development, it is rarely single. Frequently the urethra and the vagina are absent. Malformation of the vagina or uterus and developmental defects of other pelvic organs, and even hare-lip and spina bifida, are not uncommonly found associated with this anomaly. The ventral cleft may be limited to the region of the umbilicus, to the symphysis, or may involve the entire inferior half of the anterior abdominal parietes. When the ventral fissure is situated near the umbilicus, the pubic symphysis is closed, and the urethra, the inferior portion of the bladder, and the external sexual organs are normally developed. Fissure limited to the lower part of the bladder and the corresponding portion of the pelvis is very seldom found. When the malformation involves the lower portion of the abdom-

inal parietes, there is usually separation of the pubic bones, the clitoris is cleft or undeveloped, the urethra and possibly the vagina are absent. The posterior bladder-wall is pushed forward by the intra-abdominal pressure and protrudes into the opening in the abdominal wall. The latter condition is known as exstrophy of the bladder. The exposed mucous membrane is inflamed and swollen. The ureteral orifices are usually exposed to view. The ureters are generally enlarged, sometimes having a diameter of two, or even eight or ten, centimetres, and their pelvic course and relations are altered. The exposed vesical mucosa of the posterior wall may take on to some extent the appearance of epidermis. The urethra either is impervious or, more frequently, is entirely absent.

Treatment of Exstrophy of the Bladder.—All devices thus far proposed for collecting the urine are useless. No plan offers any relief except a plastic operation, and this is only palliative. Even with the best result possible, the surgeon can do no more than diminish the annoyance which comes from the flow of urine over the surrounding external surfaces. Preparatory to operation the general health of the patient must be reinforced by the use of tonics and a suitable, hygienic regimen. As far as possible, morbid conditions of the urine should be corrected and the parts about the field of operation placed in a healthy condition. Whatever operative procedure is adopted, the urethra should first be restored. Of the numerous plastic operations that have been proposed for extroversion of the bladder, Wood's operation is a good example of the best general method of procedure. This consists first in dissecting a flap from the central portion of the abdominal wall immediately above the fissure and large enough to close the bladder completely ; this should have a large pedicle. A lateral flap is taken from each groin, the superficial epigastric and the external pudic artery being included in the flap. The umbilical flap is turned down over the abdominal opening, with its skin surface towards the mucous membrane of the bladder. The margin of the abdominal fissure is vivified and the edges of the flap are stitched thereto. The groin flaps are then brought together with their raw surfaces in contact with the raw surface of the central flap and fixed in position by sutures. The parts may be protected after operation with a coating of iodoform and collodion. This plan, if successful, concentrates the flow of urine at a single point, but does not restore the function of the bladder. A urinal will still be required, and can then be used to advantage.

Berg (*Nord. Med. Ark.*, Bd. iii. Heft 3) recommends the following procedure, which he has employed with satisfaction. At a preliminary operation he takes from one inguinal region a single flap large enough to cover the abdominal opening and form the anterior bladder-wall. The raw surface of the flap he covers with epidermis according to Thiersch's method. At a second operation the flap, which now has two skin surfaces, is stitched to the edges of the abdominal fissure in the usual manner. When the capacity of the bladder permits and the mucous membrane is

sufficiently healthy, he advises uniting the vesical edges in the median line without any preliminary operation. The abdominal opening is then to be closed with a skin flap.

Double Bladder.—Cases of supposed duplicity of the bladder have been described by several writers. Many of the recorded examples of double bladder, however, are susceptible of some other explanation. Sacculation of this viscus may simulate multiple bladder. Mollenetti's case, in which there were five bladders with a common urethra, was probably of this character. A distended urachal pouch or a congenital cyst may be mistaken for a supernumerary bladder. A complete division of the bladder into two halves by a septum is rare. Incomplete division is not so infrequently observed.

<div align="center">CYSTOSCOPY.</div>

Bruck, of Breslau, first proposed to effect the illumination of various parts and cavities by taking advantage of the diaphanous property of the tissues. For the examination of the bladder he suggested the introduction into the rectum of a properly protected platinum wire at a white heat. The interior surface of the bladder thus illuminated was then to be examined through a urethral speculum. This suggested to Nitze the principle upon which the present electrical cystoscope is based. In 1877 he conceived the plan of introducing a light into the cavity to be examined, with an optic apparatus which magnifies the part to be brought into view.

Leiter's cystoscope (Fig. 9) consists of a metal tube of calibre No. 22 French, with a single fixed angle near its distal end,—a *cathéter coudé*.

<div align="center">FIG. 9.</div>

<div align="center">Leiter's cystoscope.</div>

On the upper or concave surface of the beak is a window of rock-crystal. A miniature electric lamp is located within the instrument, behind this window, and is controlled by a switch at the ocular end. Its rays are projected through the window, illuminating the field to be examined. Another window is placed at the distal end of the straight portion of the tube, close to the angle and on the same side of the tube as the first; within the instrument at this window is a totally reflecting prism, which receives the rays from the illuminated field and reflects them along the shank of the cystoscope to the operator's eye. The image of the vesical surface thus brought to view is magnified by means of a telescope placed in the shank of the instrument.

Two different instruments are desirable for exploration of the entire vesical surface: one with the window on the concave side, as above described; and, for the inspection of the base, one with the window on the convex side.

The conditions necessary for the employment of the cystoscope are as follows: first, the meatus and urethra must be of such calibre as to permit the passage of a No. 22 French sound; secondly, the bladder capacity must be from two to four ounces; thirdly, the fluid in the bladder must be transparent. One hundred and fifty cubic centimetres of fluid (ʒv) expand the folds of the intra-vesical surface; more than this quantity places the anterior wall of the bladder so far away that it cannot be properly inspected. The minimum amount of fluid employed for the purpose is sixty cubic centimetres (ʒii): a bladder which holds less cannot be illuminated.

The filling of a diseased bladder to the proper extent is sometimes impossible because of irritability. This can be overcome by cocaine. Cases of poisoning from adopting Nitze's plan in its employment are, however, reported; Albarran has observed a fatal case. Morphine by suppository or by subcutaneous injection usually answers the purpose. Narcosis by ether or by chloroform is rarely necessary. If the urine be cloudy, the bladder must be previously emptied and washed out. Nitze recommends distention of the bladder with a half-per-cent. carbolic or normal salt solution. Before using the cystoscope the beak should be immersed in water and the light tested to see that it is in working order. Sterilized glycerin is used as a lubricant. The examination is conducted with the patient in the lithotomy position.

The dangers of cystoscopy, all of which are easily preventable with care, are burning of the mucous membrane, breakage of the lamp, and infection of the bladder.

Direct Examination of the Bladder with the Pelvis Elevated.—Dr. Robert T. Morris, of New York, has utilized straight endoscopic tubes for vesical examination. Kelly has recently demonstrated the advantage gained by extreme elevation of the pelvis for examining the bladder through the urethral speculum. By this method the interior of the bladder, including the ureteral orifices, can be brought under visual examination, and direct application of remedial agents can be made. For an account of Kelly's method we quote from his original paper:[1] "The following instruments and accessories are required for the examination: a female catheter, a series of urethral dilators, a series of specula with obturators, a common head-mirror and lamp (argand burner or electric light), long, delicate, mouse-toothed forceps, suction apparatus for completely emptying the bladder, ureteral searcher, ureteral catheter without a handle, several bran bags or an inclined plane for elevating the pelvis. The bladder is first emptied as completely as possible by the catheter; a residuum of from one to several

---

[1] American Journal of Obstetrics, January, 1894.

teaspoonfuls of urine always remains, even though the bladder is evacuated with the patient in the standing posture. In order to determine the proper dilator to begin with, I calibrate the meatus urinarius externus by means of a slender metal cone ten centimetres long, marked in a graduated scale from its point (two millimetres) to its upper end (twenty millimetres in diameter). (Fig. 10.) The calibrator is pushed into the urethra as far as it will readily go, and the marking at the meatus externus is noted. A dilator of the diameter indicated by the calibrator is then passed through the urethra by holding the handle at first well above the level of the external meatus, upon which the point rests, and carrying the dilator on through the urethra and into the bladder by a gentle sweeping curve of the hand downward and inward towards the urethra. By introducing the dilators as

FIG. 10.

Urethral calibrator: the short lines indicate the diameter in millimetres. (Kelly.)

they occur in the series, the average female urethra can easily be dilated up to twelve millimetres in diameter, with only a slight external rupture. I have never seen a tear more than two or three millimetres in length and from one to one and a half in depth. I have as yet had no occasion to incise the meatus to avoid extensive rupture.

" The metal dilators which I use for this purpose are double-ended and of a flattened S-shape, each end representing a single dilator in the series. (Figs. 13 and 14.) The points are conical ; a flattened area in the middle, upon which the diameters are marked, affords a convenient grasp. The series begins with No. 5 and runs in pairs up to No. 20 : thus, Nos. 5 and 6 are made of one piece of metal, 7 and 8 of one piece of metal, and so on through the series. The calibre of both dilators and specula is marked in millimetres.

" As soon as a dilatation of from twelve to fifteen millimetres is reached, a speculum (Fig. 15) of the same diameter as the last dilator is introduced and its obturator removed. *The hips of the patient are now elevated* on the cushion or on a short inclined plane, twenty to thirty, or even forty centimetres, eight to twelve or sixteen inches above the level of the table. (Fig. 12.) There are sixteen specula, varying from five to twenty millimetres in diameter, the successive sizes increasing by one millimetre. The specula are cylindrical, nine and one-half centimetres long, and each is provided with a conical trumpet-shaped mouth to assist in reflecting the light into the bladder. Each speculum is fitted with an obturator. The calibre is marked in millimetres on a little handle at the side of the speculum.

" The examiner now puts on the head-mirror and prepares to inspect the bladder. An electric drop-light, an argand burner, a lamp, or a candle, in a dark room, is held close to the patient's symphysis pubis (Fig. 16), so

that the light can be easily caught by the head-mirror and reflected into he bladder.   A good direct light from a window will also suffice.   Upon withdrawing the obturator, the pelvis being elevated, the bladder becomes distended with air, and, by properly directing the reflected light, all parts of the interior are accessible to direct inspection. If a pool of urine remains in the bladder, it should be withdrawn by means of a simple suction apparatus. (Fig. 17.) If there is a residuum of not more than two or three cubic centimetres, it can be easily removed by little

FIG. 13.   FIG. 14.

FIG. 15.

Double urethral dilators.—The smaller sizes, Nos. 5 and 6, are used only when the calibre of the urethra is very small or is narrowed by stricture.

Kelly's speculum and obturator.

balls of absorbent cotton grasped with long, delicate, mouse-toothed forceps, the teeth of which are slightly recurved.   The facility with which foreign bodies are removed from the bladder by this method can be demonstrated by dropping a pledget of cotton into the bladder.   It can be seen with the utmost ease, picked up, and removed without difficulty.

"The posterior wall of the air-distended bladder lies two to five centimetres distant from the anterior wall, and over this white background which presents itself to the eye of the observer is visible a beautiful net-work of

branching and anastomosing vessels. The veins accompanying the arteries are easily distinguished by their dark color. The larger vessels evidently come to the surface from the deeper layers of the bladder, and they branch stellately, divide, and anastomose. By elevating the handle of the speculum, the field of vision sweeps over the base of the bladder until in some cases the region of the inter-ureteric ligament comes into view, often marked by a slightly elevated transverse fold or a distinct difference in color.

Fig. 17.
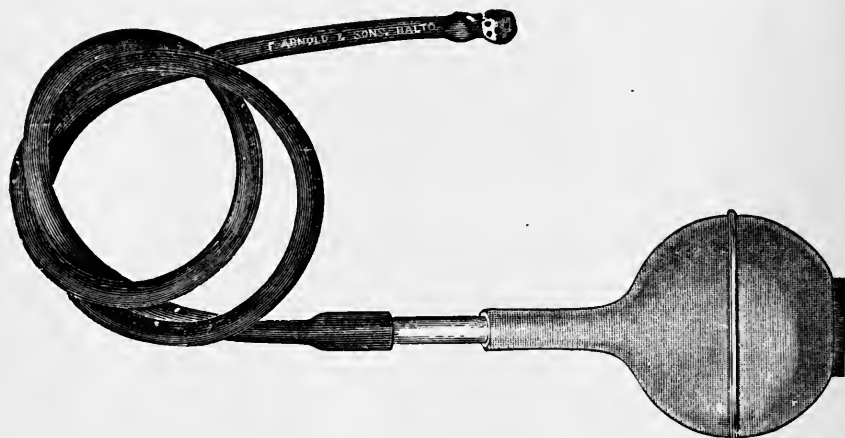
Kelly's suction apparatus (three-fourths natural size), used for withdrawing residual urine.

"By turning the speculum 30° to one side or the other and looking sharply, a ureteral orifice is discovered. The ureteral orifices and their surroundings are not constant in appearance; sometimes the orifice appears as a dimple or a little pit, or, in inflammatory cases, as a round hole in a cushioned eminence; again, it may be scarcely visible even to a trained eye, appearing as a fine crack in the mucosa; and occasionally it is so obscure as to be recognized only by the jet of urine as it escapes, or by a slight difference in the color of the mucous membrane at that point." The mucosa about the ureteral orifice is, as a rule, of a deeper rose color than the remainder of the mucous membrane of the bladder.

"A valuable aid for a beginner searching for the ureteral orifice is the following. A point is marked on the cystoscope five and one-half centimetres from the vesical end, and from this point two diverging lines are drawn towards the handle, with an angle of 60° between them. The speculum is introduced up the point of the V, and turned to the right or left until one side of the V is in line with the axis of the body. Then, by elevating the endoscope until it touches the floor of the bladder, the ureteral orifice will usually be found within the area covered by the orifice of the speculum. In order to ascertain whether it is the ureter which lies within the field, I use as a searcher a long, delicate sound with a handle bent at an angle of 120°, which is introduced through the speculum into the suspected

ureteral orifice which is under inspection.   (Fig. 21.)   The searcher passes easily from two to six centimetres up the ureter, and the lateral walls of the orifice are slightly raised, appearing as distinct folds with a dark pit between them.   The searcher may be withdrawn and the ureteral catheter at once introduced if it is desired to collect urine direct from the kidney.

FIG. 20.

Kelly's delicate mouse-toothed forceps (three-fourths natural size).

"The ureteral catheters which I use for direct catheterization are quite different from those heretofore employed. They are straighter, and either have no handle or only a small one which will readily pass through the No. 10 speculum. The catheter may be left in place some minutes or an hour or more. The urine which accumulates in the mean time in the bladder necessarily represents the discharge of the opposite kidney. In this way the urine of both kidneys may be isolated by simply introducing one catheter.

"By placing the patient in the genu-facial posture an extreme distention of the bladder is obtained, in the form of a flattened ovoid. In this posture the inter-ureteric ligament also comes sharply into view, but the ureters are not so readily seen." This posture, according to Kelly, is indispensable in some inflammatory conditions of the bladder resulting in thickening of its walls, thus preventing its ballooning in ordinary positions. Sims's position, modified by elevating the pelvis upon pillows, can be utilized in this method of examination, but with less success than the dorsal posture.

FIG. 21.

Kelly's searcher.

"*Simple, Direct Catheterization without Pelvic Elevation.*—It is possible to catheterize the ureters with the patient simply in the dorsal position,

without elevation of the pelvis. The success of such an attempt depends upon the examiner's familiarity with the position and appearance of the ureteral orifice on the posterior wall of the bladder. The manipulation necessary to expose the ureteral orifice becomes with practice almost instinctive. The bladder is emptied by the catheter, the ureter is dilated, and the speculum No. 10 or 12 introduced from five and one-half to six centimetres, and its outer end elevated until the base of the bladder appears, when it is turned 30° to the right or the left, and with a little patience in searching the ureteral orifice is found."

When dilating the urethra with specula smaller than No. 14, an anæsthetic is unnecessary, except in nervous women. When, in such cases, it is necessary to make a thorough examination, an anæsthetic is generally advisable. Local anæsthesia by means of cocaine may be used to facilitate dilatation, and is often the best form of anæsthesia.

By this method of examination many apparently functional affections of the bladder will be found to belong to the domain of demonstrable diseases. To generalize from the cases lately under my care, I am able to say that cystitis is often a localized disease limited to a special area of the bladder. Tubercular and ulcerative cystitis can be detected at once. Tumors, calculi, and fistulæ are readily found, particularly with the patient in the genu-facial posture. Cicatrices stand out in sharp relief. Cases usually called irritable bladder show definite areas of hyperæmia surrounding and between the ureteral orifices. In a case of incontinence recently under my care I found an extreme injection of the mucosa over the inter-ureteric ligament.

In certain cases the knee-chest position may be used to advantage. In this posture the bladder is easily ballooned and the location of the ureteral orifices more readily detected.

FUNCTIONAL DERANGEMENTS.

Cases relegated to this class were formerly more numerous than at present. Under improved methods of diagnosis many vesical disorders apparently functional are found to have an organic basis. The term irritable bladder, under which the functional derangements of the bladder are usually classed, is open to the objection that it implies a distinct pathological entity, while in fact the vesical disturbances in question are merely the symptoms of disease in other organs. The causes are various.

The local disorder may be one of the manifestations of a general neurosis. It is frequently observed in nervous and hysterical women. Frequent urination, incontinence, and spasmodic retention are often seen in this class of patients, from no other cause than disordered innervation. Any influence which acts to depress or excite the nervous system may be a contributing factor.

Vesical irritability is not an infrequent result of abuse of the sexual functions. Violent emotional disturbances are sometimes attended with

loss of control over the vesical sphincter. This is illustrated in the occasional effect of severe fright. Examples of the extent to which mental influences may affect the bladder are the refusal of the sphincter to relax in the presence of another person, and the opposite effect of the sound of running water.

In many instances the vesical disorder is of reflex origin. Urethral caruncle, stricture, tumors, and other diseases of the urethra may furnish the source of the vesical irritation. Ureteral disease and painful affections of the vagina may act in like manner. Anal fissure, hemorrhoids, stricture at the lower portion of the rectum, ascarides, and other causes of rectal irritation are commonly recognized sources of retention and other vesical disturbances. Inflammatory disease of the uterus, tubes, ovaries, or pelvic peritoneum frequently gives rise to irritable bladder. Painful irritability is often observed after abdominal operations in which the adjacent pelvic viscera have been concerned. Greatly increased or diminished density of the urine makes it irritating to the bladder; so, too, do hyperacidity and other marked alterations in the composition of the urine.

Mechanical disturbances play a prominent part in the etiology. Cystocele, the traction of a misplaced uterus upon the vesical neck or of a tumor to which the bladder has become adherent, pressure of a gravid uterus or of a pelvic neoplasm, are potent causes of vesical disturbance.

Symptoms.—Functional derangements of the bladder often closely simulate organic disease. The symptoms resemble those of cystitis. There are dull pain and a sense of weight in the region of the pubes, often increased on standing or walking. The pain is felt most at the vesical base and neck, the nerve-supply being most abundant in this region.

Urination is frequently difficult, painful, or sometimes, owing to persistent urethral spasm, impossible. When the cause resides in some morbid property of the urine, the altered character of the secretion is apparent on inspection or with the aid of simple chemical tests.

Diagnosis.—Generally the diagnosis is made by a chemical and microscopical examination of the urine. A healthy condition of the urine excludes organic disease of the bladder; so, too, does the absence of albumin, pus, blood, and excess of vesical epithelium. Simple hyperacidity or alkalinity, extreme concentration or dilution, of the urine, are significant. Exploration of the bladder by abdomino-vaginal palpation, especially of the inferior portion of the organ, helps to exclude cystitis and foreign bodies. The uterus, ovaries, tubes, broad ligaments, the urethra, the pudendum, and the rectum must be examined for the recognized cause of reflex vesical irritation. The presence or absence of neurotic tendencies in the patient should also be taken into account. When in doubt, a careful cystoscopic examination is conclusive, best by the direct method.

Treatment.—The treatment must be ordered with reference to the cause. A suitable hygienic and tonic regimen will do much to improve the condition of the nervous system. Open air, sunlight, and a well-regulated

system of physical culture are valuable remedial agents in the treatment of nervous women. To this must be added the correction of injurious habits. Tonics, including iron, and especially strychnine, are often potent aids in establishing a better nervous tone. Hot vaginal or rectal douches, hot sitz baths, and the application of moist or dry heat to the suprapubic region are valuable sedatives. Bromides in doses of twenty to thirty grains by the mouth, extract of belladonna, one-half grain, in suppository, or chloral, twenty to thirty grains, in solution by the rectum, and very rarely the use of opiates in the same manner, may be required to subdue the vesical irritability ; the chloral may be injected in warm milk or in starch water. The food should be such as the patient can easily digest. Constipation must be prevented. Departures from the normal density or reaction of the urine should be corrected. Too concentrated urine calls for a more liberal ingestion of liquids and the use of mild diuretics. In excessive acidity the alkaline waters, such as Vichy or Apollinaris, are indicated. Alkaline conditions of the urine are corrected by the administration of the benzoates. When the vesical trouble is a reflex from disease of other pelvic viscera or is due to mechanical irritation, the provoking cause must, if possible, be removed.

In enuresis, belladonna pushed nearly to the point of intolerance is an agent of great value. The smooth galvanic current to the strength of five to twenty milliampères is frequently useful ; one pole should be placed over the suprapubic region, and the other over the upper part of the sacrum or in the vagina against the vesical neck. The sittings may be repeated once or twice daily. Cold baths to the lumbo-sacral region at night are sometimes useful. The hypodermic injection of strychnine may be tried.

In this affection Sänger practises massage of the urethra as follows. He introduces a metal catheter five to seven centimetres deep into the bladder. While the index finger of the right hand closes the end of the catheter, the left index finger is placed on that part of the catheter which is just outside the meatus urinarius, and firm but elastic pressure is exercised by this finger, first downward and then to either side. In this manner the sphincter vesicæ and the muscles of the urethra are forcibly stretched.[1]

CYSTITIS.

Cystitis in the female is of frequent occurrence. The process may be acute or chronic, local or general. It varies greatly in intensity and duration, lasting from a few days to several weeks. In the beginning stage the pathological changes consist mainly in congestion and swelling of the affected mucous membrane. In fully developed cystitis there is more or less inflammatory thickening of the bladder-walls, and the mucous surface is bathed with muco-pus and frequently eroded in patches. Slight hemorrhage may occur from the denuded areas. In the chronic stage the

---

[1] Weekly Medical Review, June 20, 1892.

structural changes are more pronounced; the thickening of the vesical walls is much increased and the capacity of the bladder diminished. The mucosa is studded with recent ecchymotic patches or with pigmentary stains left by former ones. It is ulcerated in patches, and is frequently the seat of polypoid growths. The ulcerated areas secrete pus freely, and sometimes bleed. The ulcerating process is aggravated by the irritant effect of the decomposing urine; sometimes it invades the muscular coat, and it may even perforate the bladder-walls. Hypertrophic thickening of the vesical walls may give rise to partial occlusion of the ureteral orifice, damming back the urine and resulting in dilatation of the ureters, hydronephrosis, and in some cases serious injury to the kidneys. Uretero-pyelitis and extensive organic disease of the kidney occasionally result from extension of the vesical inflammation.

In cystitis produced by over-distention the walls of the bladder are extremely thin. In these cases the inflammation is generally diphtheritic in character and the necrotic mucous membrane is partially or wholly exfoliated; the latter may come away entire or piecemeal. Rarely the phagedænic process involves the muscular and even the peritoneal coat. In the severest forms of diphtheritic cystitis the entire bladder may be destroyed by the sloughing process. A form of vesical ulcer analogous to round ulcer of the stomach has been described by Rokitansky.

Etiology.—The most frequent cause of cystitis is the introduction of infectious material upon the catheter or other instruments passed into the bladder. Any condition which lowers the resisting power of the bladder-epithelium favors the development of the septic process: cystitis is accordingly a frequent complication of the puerperal state. The mucous membrane of the inferior portion of the bladder is doubtless in all cases more or less contused and fissured after labor. The vestibule and vulva are bathed in germ-laden discharges. The passage of the catheter at this time is a fruitful cause of infection. Even with all the care that can be used, it is difficult to make the operation wholly aseptic; all else being clean, the urethra may be the source from which the offending bacteria are carried upon instruments into the bladder.

Cystitis by extension of the inflammatory process is a frequent result of urethritis, particularly of the gonorrhœal type. In occasional instances cystitis may result from extension of the septic process in vaginitis, ureteritis, salpingitis, pelvic peritonitis, carcinoma of adjacent viscera, or pelvic abscess contiguous to the bladder. Mechanical injuries, whether from external violence or from instrumentation within the bladder, are potent causes of vesical inflammation. The mucosa may be wounded in the unskilled use of the catheter. Retention and decomposition of urine induce cystitis. Extreme departures from the normal density of the urine it is believed may excite a mild vesical catarrh. Local chemical irritants, calculi, foreign bodies, entozoa, neoplasms, and tuberculosis are included among the causes of inflammation of the bladder. Vesical congestion may result from dis-

turbances of the cutaneous circulation; exposure to cold is, therefore, a recognized cause of cystitis. Dupuytren, Nélaton, De Quest, Gouley, and others have observed that extensive burns of the skin bear an indirect causative relation to inflammation of the bladder.

In extreme over-distention the blood-supply to the mucosa and the sub-mucous structure is cut off by the urinary pressure. If the distention be relieved early, a simple cystitis follows; but if long continued, partial or total death of the mucous membrane takes place and it is exfoliated. In a case which came under the writer's observation the mucosa was thrown off in fragments per urethram after urinary retention for ninety-six hours with accumulation of over nine pints of urine.

Symptoms.—The symptoms vary according to the cause, extent, severity, and stage of .the inflammatory affection. In all cases increased frequency of urination is the rule. Retention occurs rarely and incontinence never in acute cystitis. In the acute stage the desire to pass urine is almost constant, and is not relieved by the evacuation of the bladder. Micturition is attended with sharp, lancinating pains in the urethra and vesical neck, and is frequently accompanied with rectal tenesmus. Sometimes the urine is passed in short, interrupted spurts, even in drops, and often as many as a hundred times in twenty-four hours.

There is a feeling of fulness and heaviness in the bladder, with frequent violent paroxysms of pain, in the intervals of micturition. Sacral pain is persistent in most cases. In severe cystitis the affected organ is exquisitely sensitive, and the patient's sufferings are aggravated by the least jar or by the slightest pressure over the bladder. Finger lays stress upon increased pain on standing as evidence of trachelo-cystitis.

In septic and in diphtheritic forms the attack is usually ushered in with a chill and there are frequently repeated rigors. The temperature may reach 103° F. Grave constitutional symptoms soon follow. The patient falls into a typhoid condition, with dry tongue, cephalalgia, vomiting, sub-sultus, and delirium. Urination is sometimes obstructed by fragments of membrane, causing over-distention of the bladder. Total suppression and death by uræmia may result.

In acute cystitis the quantity of urine passed in twenty-four hours may be normal or slightly increased; the color may not be changed. The specific gravity varies from 1005 to 1020, and, if accompanied with fever, may rise to 1030. The reaction is feebly acid. After standing a few hours it becomes alkaline, and precipitates a diffuse sediment containing mucus, pus, and blood in greater or less amount, bladder-epithelium, and triple phosphates. Albumin is found owing to the presence of pus. Sometimes the urine becomes ammoniacal and exceedingly offensive.

In cystitis due to retention there is an abundant precipitate of ammonio-magnesium phosphate, the urine is alkaline, slimy, highly purulent, and contains mucus and much exfoliated vesical epithelium.

In chronic cystitis the symptoms referable to the organ itself and its

contents are similar to those above described, but of a milder type. The urine contains pus, mucus, and exfoliated epithelium in large amounts. On standing, it precipitates an extremely tenacious sediment; it is of a neutral or alkaline reaction and is sometimes fetid. The endoscope reveals the evidences of inflammation. The mucous membrane is congested, ulcerated, and studded with ecchymotic patches.

Diagnosis.—In acute cystitis the bladder is found extremely sensitive on palpation through the bladder or rectum. In chronic inflammation the thickening of the vesical walls is generally appreciable to the touch on bimanual examination. Mere irritability is distinguished from inflammation mainly by the character of the urine. In the former condition the urine is not cloudy when recently passed, does not yield the characteristic precipitate on standing, and the microscopic examination reveals no pus. A careful examination of the urethra, the uterus, the rectum, and other pelvic structures will frequently disclose the source of the reflex disorder.

Cystitis is differentiated from pyelonephritis by carefully washing out the bladder and then observing the appearance of the first few drachms of urine withdrawn by catheter shortly after the irrigation. In cystitis it will be found clear, while in pyelonephritis it will be turbid.

The diagnosis should include the determination, if possible, of the cause of the cystitis.

Prognosis.—The duration of the disease will naturally vary with the cause and intensity of the inflammation. Mild catarrhal inflammation generally subsides within one or two weeks. Chronic cystitis is in most cases an exceedingly intractable disease, even under skilful treatment. In diphtheritic forms the prognosis is grave.

Treatment.—Especially important is the prophylaxis of vesical inflammation. Among the most fertile sources of cystitis are over-distention of the bladder after labor and the consequent use of the catheter. Distention of the bladder in the first few days of the puerperium may always be detected by palpation over the lower abdomen. The obstetrician, therefore, should not trust to the statement of the patient or the nurse that the urine has been frequently and freely voided; he should learn by palpating the abdomen at his daily visits after labor whether the bladder is full or empty. Even the nurse may be taught to recognize over-distention. The tumor can be felt by palpation over the lower abdomen, and pressure upon it causes a desire to urinate. The use of the catheter should be avoided, if possible. When the patient is unable to pass water in the reclining position, the attempt usually succeeds if she be allowed to assume the half-sitting or sitting posture. In all ordinary cases this liberty is justifiable as early as six or eight hours after labor, and it exposes the patient to less danger than does the passing of a catheter.

When the instrument must be used, the whole procedure should be managed with scrupulous care to make it aseptic. The soft-rubber instrument is least likely to do mechanical injury, especially in the hands of the

nurse. It should be boiled for ten minutes immediately before and must be carefully washed after using. After sterilizing it must be handled only with hands that have been rendered aseptic. The meatus urethræ and its immediate surroundings are to be cleansed and washed with an antiseptic and the instrument passed under direct inspection of the parts. If this degree of care were always observed, infection of the bladder, even in repeated use of the catheter, would seldom occur.

In all instrumentation within the bladder similar precautions should be employed. As a preparation for the use of the lithotrite and for similar operations within the bladder, the exhibition of salol by the mouth for several days should be mentioned as a useful antiseptic measure.

In the treatment of acute cystitis, the first essential is rest in bed till the acute symptoms have subsided. Patients yield to this requirement the more willingly inasmuch as their sufferings are materially relieved thereby. The diet should be unstimulating. Fluid and semi-fluid foods, such as milk, eggs, and light broths, are most suitable; a diet consisting largely of milk is particularly useful. Stimulants and stimulating condiments must be avoided. The free use of saline laxatives relieves vesical congestion. The skin should be kept active by warm bathing, friction, and suitable clothing. It is especially important that the extremities be warmly clad.

If the urine be acid, it should be rendered neutral and unirritating by the free use of alkaline drinks. Vichy water "with extra soda" may be given, or citrate of potassium, fifteen grains three to six times daily in dilute solution. When the urine is alkaline it may be rendered acid by benzoate of ammonium given in doses of ten grains every two hours. The liberal ingestion of a citric acid lemonade has a like effect. Salol is particularly useful in ammoniacal decomposition; the dose should be five to ten grains every two hours, gradually increased till the urine is acid. Boric acid, in doses of ten to twenty grains every four hours per os, is a useful corrective when the urine is offensive. The ingestion of liberal quantities of pure water acts to dilute the urine and to render it more bland. To relieve the pain and tenesmus hot sitz baths or hot compresses to the hypogastrium may be of service. Ice-water injections per rectum may be used for the same purpose. More effectual for the control of pain is opium, belladonna, hyoscyamus, or chloral. These drugs are best given by the rectum. Opium must be used with caution, if used at all, owing to its tendency to produce constipation and vesical congestion as well as the danger of establishing the opium habit. Perhaps the most suitable preparation of opium for the purpose is Dover's powder. Chloral is one of the least objectionable of the foregoing narcotics; it may be given by the bowel in twenty-grain doses, dissolved in two or three ounces of starch water or milk. In case of insomnia, one-half to one drachm of chloral may be given in this manner with most satisfactory effect. Bromide of sodium in twenty-grain doses by the stomach, and repeated once in four hours, often acts more kindly than opium for the relief of pain and tenesmus, especially

in highly nervous women.   Cannabis indica subdues the pain quite as effectually as opium, and with less injurious after-effect.

Irrigation of the bladder may be resorted to after the acute symptoms have subsided.   Most useful for this purpose are boric acid in three-per-cent. solution, nitrate of silver in strength of one-tenth to one-half per cent., permanganate of potassium in one-tenth- to one-third-per-cent. solution, creolin one-half-per-cent. solution, gradually increased to two-per-cent., or carbolic acid (1 to 500).

In chronic cystitis special attention must be paid to the general health. A good diet and hygienic and tonic measures are essential.   Opium is to be avoided if possible.   Cannabis indica or the bromides may be used to relieve tenesmus.   Alkaline reaction of the urine should be corrected as in the acute stage.   If the urine be purulent, benzoic acid will be found of service.   The following formula is recommended:

> ℞ Acid. benzoic., ℨi;
> Aq. aurant. flor., ℥iss;
> Syrup., ℥iii;
> Aq., ℥xxvii.   M.
> Sig.—A glass to be drunk between meals.

Of the balsamic preparations there is none better than a pure sandal-wood oil; from three to eight capsules of ten minims each may be given daily.   Eucalyptol, in doses of five to thirty minims three times a day, in emulsion or in capsule, is a useful remedy.

Here the treatment consists mainly in local measures.   Much depends on the technique of vesical irrigation.   A suitable instrument for this purpose may be improvised as follows.   A soft velvet-eyed rubber catheter is joined to a piece of rubber tubing by a short piece of glass tube.   A small glass or agate iron-ware funnel is connected with the other end of the rubber tube.   The whole apparatus may be about sixty centimetres in length.   (Fig. 23.)   It is to be sterilized by boiling for twenty minutes immediately before using.   After carefully cleansing the meatus urethræ and its immediate sur-

FIG. 23.

Apparatus for irrigating the bladder.   (Skene.)

roundings, the catheter, well lubricated with sterilized vaseline, is introduced and the urine withdrawn through the catheter tube and funnel. Great care is to be used to complete the evacuation very gradually, otherwise the bladder-walls may contract violently upon the catheter and be injured thereby.   While the instrument is still *in situ* and its lumen filled

with the column of urine, thus preventing the entrance of air, the funnel is filled with the solution for injection and gradually raised. In this manner the bladder is slowly distended. The quantity to be injected must depend upon the character of the solution and the degree of vesical irritability: in some cases an ounce is all that will be retained without causing pain. The maximum volume of fluid injected should rarely exceed two to four ounces. The funnel is then lowered and the bladder evacuated in the same careful manner as before. This process is repeated till the washings are perfectly clear. The patient lies in the dorsal position, with the knees drawn up and well apart. The bladder should be thoroughly washed out before throwing in the remedial injection. For this purpose the normal salt solution or a borax solution, one-half to one drachm to the pint, is less irritant than plain water. The temperature of the irrigating fluid should be 100° to 105° F. The remedial injections may be repeated once or twice daily. Suitable antiseptic solutions for irrigating the bladder are the mercuric chloride (1 to 10,000), the permanganate of potassium, the nitrate of silver, or the creolin solution already mentioned. Tyson praises as an irrigant a solution of salicylate of sodium (ℨi ad Oi). Methylene blue (gr. i to gr. ii ad ℨi), and hydrogen dioxide, diluted with one to three volumes of boiled water, are useful injections, especially in purulent cases. Injections of ichthyol in water (one-half to one per cent.) have been highly recommended. Ichthyol is especially useful in gonorrhœal cystitis. In rebellious cases a two-per-cent. solution of resorcin may be used, or twenty drops of a strong nitrate of silver solution, ten grains to the ounce, may be employed. Iodoform injections have been used with excellent effect. The following formula is employed: iodoform fifty parts, glycerin forty parts, mucilage of acacia ten parts. An ounce of this mixture may be injected once daily; if well borne, the injection may be repeated two or three times daily.

In cases of much pain after the use of stimulating injections the bladder may be washed out with a solution of sulphate of morphine, one or two grains to the ounce. A still better calmative is hydrochlorate of cocaine; a few drops of a two- to four-per-cent. solution may be used. Care must be taken that a toxic dose of these agents be not left in the bladder. Recent observations have shown that most drugs are actively absorbed by the vesical mucous membrane, especially in the presence of erosions.

When other measures fail, the bladder must be drained. For this purpose the self-retaining catheter has been employed, but it is not to be advised, except where operative procedures are refused. When resort must be had to this method of drainage, the urethra is to be first dilated to the point of paralyzing the vesical sphincter. The dilatation is accomplished slowly by the use of a series of graduated dilators. The bladder is washed out daily with the normal salt or boric acid solution. When the vesical sphincter regains its tone the catheter should be removed, the dilatation repeated, and the catheter replaced.

More satisfactory for draining the bladder is the formation of a vesico-vaginal fistula. Emmet operates as follows. The patient is placed in the Sims position, under ether, and the perineum well retracted. A sound is passed into the bladder and its point made to press heavily against the septum at a point in the median line one centimetre above the vesical orifice of the urethra. The parts are steadied with a tenaculum and are incised upon the top of the sound. The blunt blade of the scissors is carried through the incision into the bladder, and the opening lengthened in the direction of the cervix uteri to the distance of three or four centimetres. To prevent the fistula from closing, the vesical and vaginal mucous membranes should be stitched together, or the patient may maintain the opening by passing the finger through it night and morning. Instead of the knife or scissors, the Paquelin cautery at a dull red heat may be used.

Byrne, of Brooklyn, has modified the operation, making it easy and expeditious, by the use of a specially constructed forceps, one blade of which is passed into the bladder, the other into the vagina, thus grasping the vesico-vaginal septum ; the vaginal blade is fenestrated and the vesical blade grooved. (Fig. 24.) The thermo-cautery knife is introduced through

Byrne's cystotomy forceps.

the fenestra at a dull red heat and the septum divided, the knife being completely controlled and guarded by the fenestra and groove in the forceps. The operation must, of course, be done under an anæsthetic, best with the patient in the dorsal position. By the use of the cautery not only are hemorrhage and sepsis prevented, but the operation is accomplished with greater rapidity and the fistula is readily kept open. Suprapubic cystotomy has been done in obstinate cases of cystitis, but it offers no advantage over the vaginal operation.

Tuberculosis.—Tuberculosis of the bladder is regarded as a very rare disease. It is possible, however, that cystitis may yet prove to be more frequently of tuberculous origin than has hitherto been assumed. Rovsing found tuberculous bacilli in the bladder-discharges of three out of thirty cases of cystitis. In the great majority of instances it is dependent upon general tuberculosis, or is associated with tuberculous disease of the ureters and kidneys. It seldom occurs as a primary affection. As in tuberculosis of other organs, while no age is exempt, it is most commonly met with in the young.

Pathology.—The favorite seat of vesical tuberculosis is the neck of the bladder. In the earlier stages of the disease the mucosa is studded with miliary tubercles. These coalesce into caseous nodules, and later the tuberculous patches break down into ulcers.

Symptoms.—The symptoms are those of cystitis. Micturition is frequent and painful; the base of the bladder is extremely sensitive to pressure, and pain is increased by walking or riding. The urine may contain blood. Hæmaturia, however, is a more conspicuous symptom in the earlier than in the later stages of the affection; it is frequently the first to attract attention. In advanced tuberculous cystitis the urine contains pus.

Diagnosis.—If we look only to the symptoms, tuberculosis is very difficult of distinction from cystitis due to other causes. Absence of the usual causes of the cystitis is significant. Tubercular disease of the bladder is at once suggested by the presence of tuberculosis in other organs. Electrical cystoscopy is available for diagnosis when the urine is not bloody. Most conclusive are the direct examination of the bladder through the open speculum and the detection of the Koch's bacillus in the urine. The bacillus, however, is not always to be found.

Prognosis.—The prognosis is bad. In exceptional cases the patient may live eight or ten years; generally the duration of the disease does not exceed two. Death usually results from general tuberculosis.

Treatment.—The systemic treatment does not differ from that adopted in tubercular disease of other organs. Locally, injections of the glycerin-iodoform mixture have been found useful. Pain is to be controlled as in other forms of cystitis. In obstinate cases cystotomy may be advisable for the purpose of curetting away the tuberculous growths and also for drainage, the fistula being left open. The sufferings of the patient are thereby materially lessened, and in many instances a symptomatic cure is ultimately possible, so far as the local disease is concerned. Burrage, of Boston, has recently reported a case in which a tuberculous patch was satisfactorily curetted and cauterized with a nitrate of silver solution through a No. 14 Kelly endoscope.

INVERSION OF THE BLADDER.

Inversion of the bladder or extroversion through the urethra is very seldom met with. It consists, generally at least, in a prolapse of all the coats, not, as some writers have assumed, of the mucous membrane alone. It may occur at any age, but is most frequently observed in children. It is sometimes brought on abruptly by violent straining efforts during defecation or micturition. McKay (*Canada Lancet*, February, 1892) reports a case caused by the straining and tenesmus attendant upon a prolapsus recti. More frequently the prolapse is gradually developed.

Symptoms.—In partial prolapse of the vesical wall, before the tumor makes its appearance at the meatus the symptoms do not differ essentially from those of a foreign body in the bladder. In adults there are abdominal

pain and vesical tenesmus when the prolapse is complete; in children these symptoms are seldom noted. The tumor may reach the size of an orange, but is, usually easily reducible. In chronic cases the vulva and thighs are eroded from the constant dribbling of urine. Continued traction upon the ureters sometimes results in ureteritis; extension to the kidneys and uræmia may then supervene. The prolapsed portion of the bladder-wall may become strangulated, with grave constitutional disturbance.

Diagnosis.—Inversion of the bladder must be distinguished from urethral or vesical polypi and from annular urethral prolapse. When reduction is possible, differentiation is readily made between vesical polypi and inversion by exploring the cavity of the bladder after replacing the protruding mass. Urethral polypi cannot be reduced within the bladder. The tumor in urethral prolapse springs from the margin of the meatus, while in vesical prolapse it is encircled by it. In the former, the urethral opening appears in the centre of the tumor; in the latter, it is annular, and surrounds the neck of the tumor. When the mouths of the ureters are exposed to view the diagnosis presents no difficulty.

Treatment.—The vesical protrusion should be carefully cleansed, and, if possible, replaced. This is to be attempted by first oiling the tumor and using gentle taxis. The use of a large sound helps to secure complete reduction, but should be omitted, if possible, owing to the danger of mechanical injury to the bladder. In partial inversion, slight forcible distention of the organ by means of a suitable injection may assist in repositing the prolapsed portion; in difficult cases the manipulation should be undertaken with the aid of anæsthesia. After reduction of the prolapse the patient must be kept for several days in the recumbent posture. A compress and T-binder may be used for retention. Straining at stool must be prevented by the use of laxatives or rectal injections, and vesical tenesmus controlled by suppositories of opium or of hyoscyamus, or by other suitable measures. More or less incontinence generally remains for a time or permanently. It is to be treated as in other cases of urethral dilatation.

VESICO-VAGINAL FISTULA.

Vesico-vaginal fistula is a direct communication between the bladder and the vagina. It may involve either the trigone or the bas-fond, most frequently the latter. The size of the opening may be no larger than a pin-point, or the whole vesico-vaginal septum may be destroyed. The aperture may be round, elliptical, angular, or a mere slit. The tissues about the edges of the fistula vary greatly in thickness, density, unevenness of surface, and color. Usually there is but one orifice; occasionally there are several.

A good example of the extent to which the vesico-vaginal wall may be injured in extreme instances is afforded in a case reported by H. M. Sims.[1] The base of the bladder and the corresponding portion of the anterior

---

[1] Transactions of the New York Obstetrical Society, 1893.

vaginal wall were entirely destroyed; the upper bladder-walls prolapsed through the opening, and the ureteral orifices were exposed to view. Dr. Malcolm McLean, in a personal communication to the writer, describes a case in which half the bladder was found prolapsed through a large vesico-vaginal fistula and protruding at the vulva. The fistulous opening extended from the cervical junction to within three-eighths of an inch of the pubic arch. The width of the fistula transversely was two and one-fourth inches. The urethra was also destroyed.

Etiology.—Vesico-vaginal fistulæ occur most frequently from difficult labors, in which the fœtal head is arrested in the lower portion of the birth-canal. Necrosis takes place from long-continued compression of the vesico-vaginal wall between the head and the pubic bones, and the injured structures subsequently slough, leaving a fistulous opening. Lacerations occurring during forceps or other instrumental deliveries seldom invade the bladder. In more than ninety per cent. of cases fistula results from neglected labors, not from measures adopted for delivery. Very rarely calculi or other foreign bodies in the bladder may perforate the vesico-vaginal septum.

Symptoms.—The most conspicuous symptom is the discharge of urine by the vagina between the acts of micturition. In case of a large fistula the flow will be constant. If the opening be small, the escape may be temporarily prevented by the pressure of the anterior vesical wall against the orifice. Sometimes a portion of the urine may be voided per urethram. The vagina usually becomes coated with urinary salts. In all cases the vulva and the inner surfaces of the thighs are excoriated by the irritating discharge, and the odor of decomposing urine is given off from the person and the clothing of the patient.

Diagnosis.—Large fistulæ may be detected by the vaginal touch; small ones can generally be located by ocular inspection with the aid of a small sound or probe. For this purpose the patient should be placed in the Sims position, and the anterior vaginal wall exposed by the use of the Sims speculum. In difficult cases the existence and location of a fistula are most readily demonstrated by injecting the bladder with milk and water or with a solution of methyl-blue, a grain to the ounce. When still in doubt as to the location of the fistula, Pozzi suggests that the anterior wall of the vagina be carefully dried and covered with a piece of dry absorbent paper; a moist spot developed on the paper betrays the seat of the fistula. The orifice once located, the direction and extent of the fistulous tract may be determined by the probe. Sometimes the examination is rendered difficult by cicatricial contraction of the vagina; preliminary dilatation may then be necessary to expose to view the seat of the fistulous opening.

Preparatory Treatment.—Before operating it is generally advisable to place the patient for a time under a course of tonic and hygienic treatment for the improvement of the general health. Time must be allowed after labor for the completion of the process of involution and for full con-

valescence; this will usually require not less than three or four months. The diseased structures about the fistula should be placed in the best possible condition for repair. Vaginal incrustations from urinary deposits are to be removed by the use of hot boric acid douches (two drachms to the quart), repeated two or three times a day for some weeks before operating. Erosions of the vagina may be pencilled with a two-per-cent. solution of nitrate of silver once or twice weekly for the same length of time.

Vaginal cicatrices which prevent easy access to the fistula, or may hinder the proper coaptation of the wound surfaces after denudation, must be divided by multiple incisions and stretched. The best time for operating is about a week after menstruation, as the healing process is thus least likely to be disturbed by the premature recurrence of the menstrual flow.

Method of Operating for Closure of Vesico - Vaginal Fistulæ.— The patient is placed in the Sims position, under an anæsthetic, the perineum being retracted with a Sims speculum. The lower end of the fistula is then seized with the tenaculum or a pair of long tissue-forceps. With a fistula knife, or scissors slightly curved on the flat, a strip of tissue is removed all around the margin of the fistula. (Fig. 25.) This strip should, if possible, be removed in one piece; there is thus less danger of leaving undenuded islets. The denudation is to be carried close to the mucous membrane of the bladder, but the latter must not be included, otherwise hemorrhage into the bladder may occur after the wound is closed. On the other hand, the strip of tissue removed should include at least a half-centimetre (one-fourth inch) of the mucous membrane of the vagina entirely around the fistula. The fistulous opening is thus funnel-shaped after the paring is completed, and the edges of the vesico-vaginal septum are evenly bevelled from the vesical to the vaginal side. This gives a broad surface for union, and is especially important when the edges are thin. The shape of the denuded opening should be such that the suture line will be straight or nearly so. Except in case of large fistulæ, it is desirable that the long axis of the opening should conform to that of the vagina, as there is thus the least strain upon the sutures. This is not always possible, the direction in which the wound is to be brought together depending largely upon the primary shape of the fistula. It is usually advisable to convert a round fistula into an elliptical one by exsecting two V-shaped pieces at opposite points on the margin.

Hemorrhage can generally be controlled by pressure with sponges or by a stream of hot water. Rarely a suture ligature of catgut may be required. The sutures are now introduced, beginning at the upper angle of the wound. The suture material used differs according to the fancy of the operator. For deep suture, silkworm-gut or plain sterilized braided silk No. 3 or No. 5 is recommended. The needles may be straight or moderately curved, and from one-half to three-quarters of an inch in length. The tissue being fixed with a tenaculum, the first suture is placed at the angle farthest from the operator. The needle is entered on the vaginal surface at a point from

one-fourth to one-half inch from the line of incision, and swept in a curve, including all the tissues down to the vesical mucosa (Fig. 26). It is then passed symmetrically through the opposite lip of the wound. Care must be taken not to include the vesical mucous membrane. The application of each succeeding suture is greatly facilitated by steadying the edges of the wound by traction upon the suture last placed. The sutures should be one-fourth of an inch apart. All the stitches being in place, the bladder is washed out with care, to free it from blood-clots. The sutures are then tied, carefully approximating the wound surfaces. (Fig. 27.) Superficial sutures of fine silk are to be inserted as required to complete the coaptation of the wound edges. The ends of the sutures should be left about

FIG. 26.

Direction of needle-track.—*B*, bladder surface; *V*, vaginal surface.

a half-inch in length, to facilitate removal. A light tampon of iodoform gauze is placed in the vagina.

Simon uses the dorsal position in this operation, with the hips elevated, exposing the fistula with his perineal retractors. This position gives easy access to the field of operation.

Edebohls points out that in extensive fistula the suprapubic method offers the great advantage that even if one could not draw together the vaginal wall sufficiently to close the entire aperture, he can at least close the opening by liberating the mucous membrane of the bladder itself from its vaginal and somewhat also from its bladder connections, and bringing its edges together. This will often succeed when no vaginal operation is practicable.

Cases are reported by Hirst, Armstrong, and Allen, in which the cervix was utilized to close the aperture. In a case of extensive complicated fistula, Pawlik removed the entire bladder, the vesical ends of the ureters being isolated, brought down, and attached in the vagina.

FIG. 28.
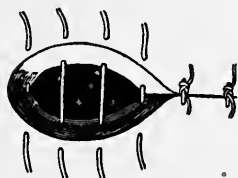
Two sutures tied.

After operation the patient is kept in the dorsal position for thirty-six hours; after that she is allowed to change her position when desirable for comfort. Opiates should be withheld if possible. The patient is catheterized every four hours for the first thirty-six hours, or oftener if there be desire to urinate; after that she may be permitted to void her urine. In case of small fistulæ the catheter may usually be wholly dispensed with, the patient being permitted to evacuate the bladder *per vias naturales* from the first. Permanent drainage by means of a catheter left in the bladder is seldom permissible.

Fig. 25.
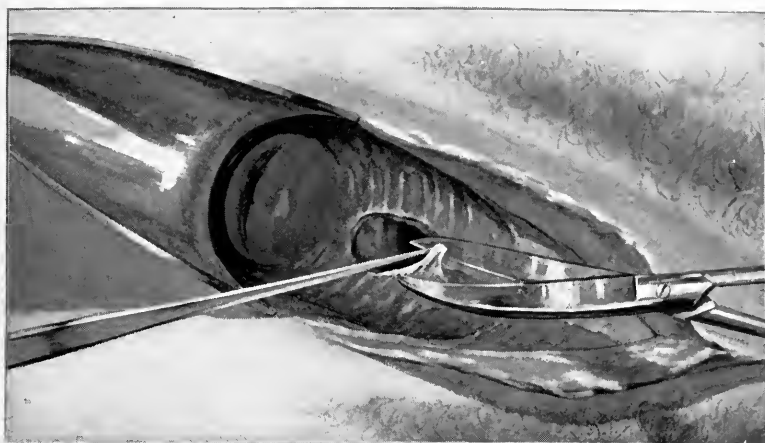
Paring the edges of the fistula

Fig. 27.
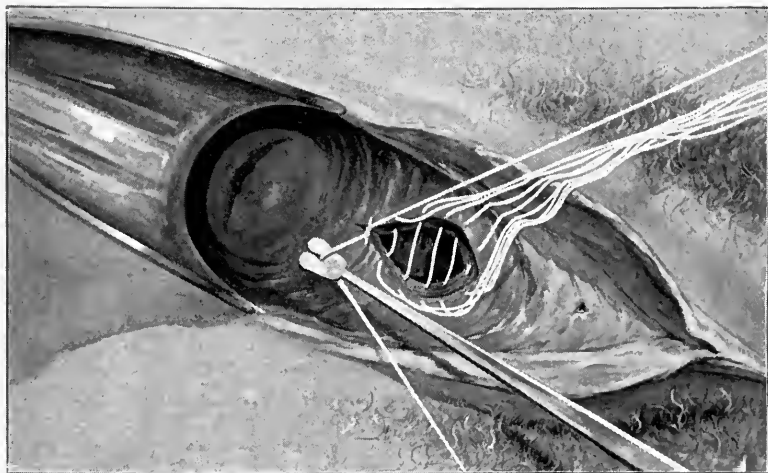
Tying the sutures.

The vaginal tampon is removed on the second day; sooner if offensive or soiled with urine. An enema is given to move the bowels on the third day, and the sutures are removed on the eighth day. The patient should remain in the recumbent position for at least two or three weeks.

VESICAL CALCULI.

Stone in the bladder is a far less common affection of the female than of the opposite sex. This is accounted for mainly by the greater facility with which small stones are expelled through the female urethra.

They are oftener of the phosphatic variety than in the male. Foreign bodies from without frequently form the nucleus for urinary deposits. Roughened areas of the bladder-wall are liable to become incrusted, and such incrustations may serve as the starting-point of calculous formations. The formation of calculi is thus frequently observed after operation for vesico-vaginal fistula. The stone usually lies free in the cavity of the bladder, changing its position with the changing postures of the patient. Rarely it is incapsulated.

Symptoms.—The patient suffers from frequent urination, dysuria, tenesmus, and occasionally enuresis. The flow of urine may be abruptly cut off at micturition, owing to the occlusion of the vesical neck by the stone. A more or less severe cystitis always coexists. Hæmaturia may occur if the shape of the calculus be such as to cause abrasions. The urine contains pus, epithelium, and mucus, with amorphous crystals of triple phosphates.

The *diagnosis* is made with the sound, by a cystoscopic examination, by digital exploration through the urethra, previously dilated, or by conjoined abdominal and vaginal palpation.

As rigid an asepsis should be observed in the use of the exploring finger, the sound, or the cystoscope as is practised in major operative procedures. The bladder should be evacuated and thoroughly irrigated with Thiersch's solution. When the sound is to be used, the bladder should be moderately distended with a two-per-cent. boric acid, a half-strength Thiersch's, or a normal salt solution. The movements of the sound are thus unobstructed, and vesical folds which might envelop the stone are obliterated. The search is to be systematically conducted, first over the most dependent portion of the cavity, then over the rest of the bladder-walls, one or two fingers of the free hand guiding and assisting the manipulation through the vagina.

Cystoscopy or digital exploration may serve to discover an encysted stone which has escaped detection by the sound. Dilatation of the urethra sufficient to admit an index finger of not more than average size is rarely followed by persistent incontinence. The digital exploration is to be assisted with the fingers of the other hand through the vagina. Frequently a vesical calculus may be felt by the bimanual manipulation as employed in ordinary pelvic examinations.

The *prognosis* is good in the absence of renal and severe vesical lesions.

Treatment.—Calculi may be removed by way of the urethra or by vaginal or suprapubic cystotomy. Small calculi can be extracted through the urethra after dilatation with graduated dilators, or removed with slender forceps through a Kelly speculum. Moderately large and friable stones may be crushed by the usual method, or under direct inspection with the aid of the open speculum, and the débris washed out. If there be much cystitis, and the stone be of large size and too hard to be crushed, vaginal or suprapubic cystotomy is to be preferred, for not only may the stone thus be removed with less resulting injury to the bladder, but drainage for the diseased organ is secured.

Removal by the urethra without lithotrity is practicable only for calculi whose diameter does not exceed twenty millimetres. Greater dilatation is likely to result in permanent incontinence. The operation is conducted as follows:

The patient is placed, under an anæsthetic, in the lithotomy position, and the urethra dilated by the gradual method to twenty millimetres or less, as may be required. Small stones may frequently be best extracted by conjoined manipulation, the stone being pushed into the urethra and through it by the use of two fingers in the vagina. When this method fails, the stone is to be grasped and removed with forceps. Manipulation through the vagina will help to secure a proper seizure.

Friable stones which are too large for removal by the foregoing methods are to be crushed with a lithotrite and the débris washed out through a urethral speculum. The crushing is repeated till all fragments are small enough to pass. Care must be taken that no particle remains behind to act as a nucleus for a new concretion. When the lithotrite is introduced, the bladder should contain three or four ounces of a half-strength Thiersch's solution or some equally bland fluid. Lifting the handle of the instrument strongly upward, the beak is made to depress the posterior vesical wall. The stone, if free, rolls into the pocket thus formed, and with the aid of the finger in the vagina is easily engaged in the jaws of the lithotrite.

When cystotomy is required, the vaginal operation is generally preferred as the simplest and safest. In the suprapubic operation the preliminary distention of the bladder is best accomplished with air instead of water, as suggested by Dr. A. T. Bristow, of Brooklyn. The peritoneal fold is lifted farther above the symphysis than is possible with water, the danger of rupture is diminished, and the operator is saved the annoyance which comes from flooding the wound with water when the bladder is opened. If the distended bladder does not rise above the symphysis it may be pushed up on the tip of a large sound passed through the urethra.

FOREIGN BODIES IN THE BLADDER.

Foreign bodies may be introduced into the bladder through the urethra either by accident or by intention. Lead-pencils, pipe-stems, ligatures, hair-pins, a crochet-needle, a rubber womb-protector, are among the arti-

cles that have been found in the bladder. Stumpff relates a case of
hæmaturia due to the presence in the bladder of a pigeon's feather covered
with ointment.

Symptoms.—The symptoms are substantially the same as in stone.
Hemorrhage is more common than in the latter affection. The degree
of disturbance depends upon the size of the foreign body and the char-
acter of its surface.

The *diagnosis* is made by the vaginal touch, by the use of the sound, or
by direct inspection through the open speculum with the aid of the Kelly
posture.

Treatment.—The treatment is substantially the same as for stone. The
foreign body may generally be removed through the urethra, best with the
aid of the open speculum.

VESICAL TUMORS.

Neoplasms of the female bladder are of infrequent occurrence. They
include papilloma, myxoma, fibroma, myoma, sarcoma, epithelioma, and
carcinoma. The malignant forms are more frequently met with than the
benign. Most commonly their site is the base of the bladder.

Symptoms.—The most constant symptom of vesical neoplasm is hæma-
turia. Growths at the vesical neck give rise to frequent and painful
urination. By falling over the urethral orifice they may interrupt the
flow of urine at micturition, or may cause retention. Exceptionally, when
the hemorrhage is free, retention may occur from obstruction of the vesical
orifice by clots. Tenesmus is usually out of proportion to the size of the
tumor. As a rule, cystitis sooner or later results. Ureteritis and pyelo-
nephritis commonly supervene. Occasionally fragments of the tumor are
expelled per urethram. Tenesmus aggravates the morbid condition of the
mucous membrane; with the growing hypertrophy the hemorrhage in-
creases. The urine contains pus, blood, mucus, epithelial scales, neoplastic
shreds, and phosphates. The general health is in time impaired, the patient
becoming thin, anæmic, and cachectic.

The *diagnosis* is made by conjoined abdominal and vaginal manipu-
lation, by the electric cystoscope, by direct examination with the finger
through the urethra, or by ocular inspection through the open speculum.
An imperfect ballottement may be obtained in case of pedunculated growths,
if the examination is made while the bladder is distended with fluid. Por-
tions of the growth may be removed and examined under the microscope.

Treatment.—The tumor may be removed through the urethra, by a
vesico-vaginal incision, or by epicystotomy.

Very small growths which are pedunculated may be twisted off and
removed through the urethra. Troublesome hemorrhage is to be controlled
by irrigation with warm water, or by gauze packing with counter-pressure
over the abdomen. For several days after operation within the bladder
the cavity should be washed out daily with a two-per-cent. solution of

boric acid. The urine meantime is to be kept bland by the use of alkaline drinks.

Byrne and Skene have employed the cautery in the treatment of vesical neoplasms. The latter makes a vesico-vaginal fistula, brings the growth or sections of it into the opening and, when possible, through into the vagina, clamps the base (most of which should be normal mucous membrane) with forceps, cuts it off with the galvano-cautery, and desiccates the portion within the grasp of the forceps. The bladder is carefully washed out with a half-strength Thiersch's solution and closed. The catheter is passed every two hours for twenty-four hours after the operation, then every four hours.

Kümmel recommends the suprapubic operation for large benign or malignant growths. The bladder wound is united by three rows of sutures,—the first through the mucosa, the second through the muscular coats, the third through the immediately overlying structures. The skin wound is but partially closed, and the lower end tamponed with iodoform gauze.

In neglected cases in which the tumor is so large that total extirpation is impossible, thorough curettage of the growth, removing as much as possible, followed with cauterization of the whole diseased surfaces, may be employed. The bladder is drained with iodoform wicking. In rare instances partial resection or total extirpation of the bladder may be advisable, with implantation of the ureters in the vagina.

THE URETERS.

Anatomy.—The ureters are two flattened white tubes which conduct the urine from each renal pelvis to the bladder. Their diameter is about five millimetres (one-sixth of an inch) when distended. They are of nearly uniform size throughout their length, save for a slight constriction usually found about two inches below the kidney. (Clark.) The length has been variously stated at from thirty to forty-five centimetres. According to Kelly and Morris, their length is about thirty centimetres (twelve inches).

The abdominal portion is from twelve to fifteen centimetres in length (five to six inches). The ureter at its point of origin from the pelvis of the kidney lies concealed by the ribs at a distance of four to four and six-tenths centimetres from the median line. They immediately underlie the peritoneum, coursing from the pelvis of each kidney obliquely downward and inward through the lumbar region until they reach the pelvic brim, where they are about five centimetres apart.

The Pelvic Portion of the Ureter.—The left ureter, after having crossed the left common iliac artery one and a half centimetres above its bifurcation, passes in front of the left hypogastric artery above its point of division, and reaches the left pelvic wall at the level of the angle of the larger sciatic notch.

The right ureter, at the distance of one and a half centimetres below the bifurcation of the right common iliac artery and vein, crosses over the external iliac artery and vein.   Thence it descends with the internal iliac

Fig. 29.
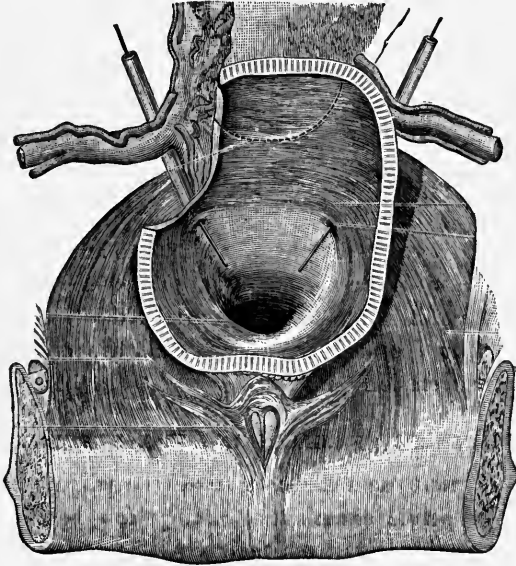
Base of the female bladder.   Anatomical relations of ureters at their entrance into the bladder.   (Savage.)

Fig. 30.
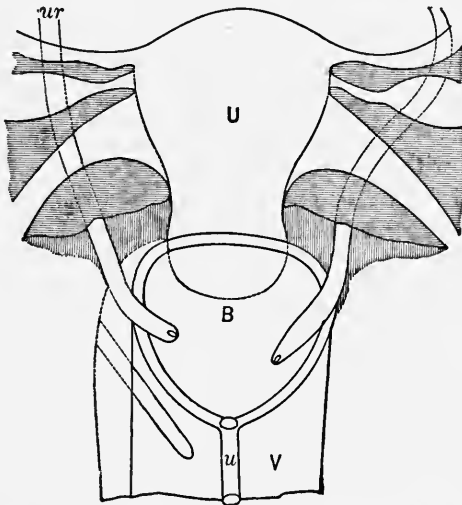
Uterus, ureters, and upper part of vagina of a woman forty years old.— *U*, uterus; *B*, bladder: *u*, urethra; *V*, vagina; *ur*, ureter.   (Garrigues.)

artery into the lesser pelvis.   For the rest of their course the ureters on both sides are alike.   Covering the point of origin of the obturator nerve,

they cross, in their downward course along the lateral pelvic wall and floor, the points of origin of the obturator, umbilical, and uterine arteries, describe an arch the convexity of which is directed backward and outward, and then terminate in the bladder.

"The distance of the lower end of the ureter from the external os uteri is nearly constant at three to three and a half centimetres. The pelvic part of the ureter in the first portion of its course hugs the pelvic wall, later it reaches the pelvic floor (levator ani). It lies below the peritoneum, with which it is joined by cellular tissue, but not between the layers of the broad ligament. On entering the lesser pelvis, the ureters first diverge, then gradually converge downward; at the distance of four centimetres from the bladder the convergence increases rapidly."[1]

After passing from three-fourths of an inch to an inch obliquely downward and inward between the muscular and mucous coats, they open upon the mucous surface of the bladder by constricted orifices. These orifices are from two to three centimetres apart, and are connected by a band known as the inter-ureteric ligament.

METHODS OF EXAMINING THE URETERS.

Palpation.—In most cases the ureters can be palpated in the usual bimanual method of pelvic examination; they can be rolled between the vaginal and abdominal fingers from their vesical termini to the point where they pass under the broad ligaments. The ureter is best found by first carrying the internal finger to the vesical neck, the cord-like urethra serving as a guide; hence the tip of the finger is carried for two or three centimetres obliquely upward and outward; here it rests over one posterior angle of the trigone. From this point the ureter sweeps outward and upward around the cervix. In favorable cases it may be readily detected by repeatedly rolling the intervening structures between the fingers of the outer and the inner hand. The normal ureter presents the feel of a narrow tape or flattened cord, without hardness. If the ureter be enlarged, palpation can be carried still farther by examining through the rectum, thus reaching that portion of the ureter behind the broad ligament and following it up over the posterior pelvic wall. It must not be mistaken in this position for the obturator artery or nerve, or the upper border of the levator ani, or the fibres of the obturator muscle, or the rim of the foramen. The diseased ureter becomes thickened and nodular, and is peculiarly prone to be mistaken for a cellulitis or an adherent ovary. (Kelly.) The ureter, when diseased, is identified by its knotty and cord-like feel, together with the fact that pressure upon it excites the desire to urinate, especially when applied to the lower portion of the tube. Kelly has shown that the normal ureter can be traced and minutely examined in the upper part of the pelvic course by introducing a ureteral bougie through the urethra and bladder

---

[1] Holl, Wiener Med. Wochenschr., Nos. 45 and 46, 1882.

into the ureter, carrying it to the brim of the pelvis, and palpating the tube through the rectum on the bougie. The internal iliac artery, which can readily be felt per rectum, affords a convenient landmark for locating the ureter in the posterior portion of its pelvic course. Here it lies generally along the inner aspect of the artery; exceptionally it is found on the outer side of the vessel.

Catheterization of the Ureters.—Ureteral catheterization as a means of diagnosis was employed by Simon in 1875. He catheterized the ureters under the guidance of the finger, after dilating the urethra with his graduated dilators. Pawlik, in 1880, introduced the method of catheterizing by the aid of external anatomical landmarks,—folds of the mucous membrane in the anterior vaginal wall. In 1886, Sänger defined the indications for ureteral catheterization. It remained for Kelly, in this country, to perfect the operation, catheterizing the ureters under direct inspection through the open speculum, as already described in connection with the methods of cystoscopic examination.

The ureters may be catheterized free-handed as follows. Pawlik, the pioneer in this method of exploration, places the patient in the genu-pectoral position. The operation, however, may be as readily done with the patient on the back, the legs strongly flexed upon the abdomen, and the pelvis well elevated. A careful antisepsis must be observed. The posterior vaginal wall is retracted by a large Simon or Sims speculum. With the bladder moderately distended, certain folds appear upon the anterior vaginal wall which serve as landmarks or guides to the location of the ureters. The degree of distention required is most accurately accomplished by first emptying the bladder with the catheter, removing residual urine with some form of suction apparatus, and then injecting one hundred and fifty to two hundred cubic centimetres (nearly six ounces) of a three-per-cent. solution of boric acid, or a methyl-blue solution (gr. i ad ℥i). On close inspection, two oblique folds may be seen on the anterior wall of the vagina which start from points a little way behind the level of the vesical neck. These folds diverge from before backward, and correspond very nearly in direction to the course of the ureters.

Fig. 31.

Kelly's ureteral catheter.

The Kelly catheter, which is a modification of that of Pawlik, is shown in Fig. 31. It is about thirty centimetres in length and two millimetres in diameter. The tip is slightly curved, and terminates in an olive-shaped point one and a half millimetres in diameter. The catheter is passed into the bladder and its point turned toward the vagina. By raising the handle the tip

is made to press gently against the posterior vesical wall, and the course of the instrument is thus marked by the slight protrusion of the septum. The ureteral orifices are situated about three centimetres behind the vesical opening of the urethra and about the same distance apart, yet their location is not constant. Beginning near the median line, the catheter is made to glide up and down over the floor of the bladder above and below the level of the ureteral openings; it is then carried a little farther out and swept up and down in a similar manner, and this is continued till the ureteral eminence is found. A sensation of tripping is felt as it passes over this point. The tip of the catheter is then brought back to the site of the ureteral orifice, and the effort made to engage it in the ureter. Once entered, the instrument is felt to be in the grasp of the tube, and may be passed with little or no resistance for some length. On removing the stopper from the catheter the urine soon begins to flow; it trickles from the instrument in a broken stream, a few drops at a time. The operation is more difficult in the nulliparous than in the parous woman.

MALFORMATION OF THE URETERS.

Ureteral duplicity is not extremely rare, some sixty cases having been reported. It may occur on one or both sides. Exceptionally duplicity persists throughout the course of the ureter. In a large proportion of cases of double ureter the kidney has two pelves, one tube arising from each and uniting with its companion before reaching the bladder. Beach[1] reports a case in which one division of the double ureter entered the bladder in the normal plane, the other terminating below as a cul-de-sac, which, post mortem, was found filled with pus. A case in which both kidney and ureter on the left side were absent is mentioned by Cutler; there was no left renal artery, nor was there any rudimentary indication in the bladder of the left ureteral orifice.

A supposed instance of congenital atresia of the ureter is reported by Colley.[2]

Occasionally one or both of the ureters, instead of emptying into the bladder, have an abnormal insertion into the vagina or rectum, or, as in congenital absence of the bladder, into the cul-de-sac which forms the inner termination of the urethra.

In a case of congenital absence of the bladder reported by Phillips,[3] the openings of the ureters appeared in the abdominal parietes as two small pouches on each side of the suprapubic region. Schatz[4] has in two instances observed a ureter communicating with the vagina, the bladder being normal in each case. Emmet, Von Massar, and Baker have reported ab-

---

[1] British Medical Journal, 1874, vol. i. p. 629.
[2] London Lancet, 1879, vol. i. p. 372.
[3] Lancet, 1879, vol. ii. p. 829.
[4] Medical Press and Circular, London, August 5, 1891.

normal ureteral insertions without any coexisting malformation of the bladder. A similar case is noted in the records of the Boston City Hospital.

Treatment.—Baker and Emmet have operated for this condition. Emmet attempted a plastic operation, making a uretero-vesical channel from the abnormal vaginal orifice to the point where the ureter should normally have entered the bladder, hoping by a subsequent operation to perforate the bladder-wall, lead the artificial canal into the vesical cavity, and close in the whole by a vaginal flap. The first part of the operation was successful, but the patient died of intercurrent pneumonia before the final step could be undertaken. In Baker's case the urine was found to escape drop by drop from a small orifice in the immediate neighborhood of the meatus urinarius. The external orifice was very small, and for a time escaped observation, yet behind the opening the canal appeared to be of considerable calibre. When a probe was introduced the ureter could easily be traced along the anterior vaginal wall to the left of the cul de-sac, passing directly over the site usually occupied by the vesical orifice of the left ureter, and separated from the vagina by a thin septum only. A probe was introduced into the ureter and cut down upon at a point about four centimetres from the meatus urinarius; the canal was found to be lined with mucous membrane. The ureter was then dissected up from the incision to a point in the vesico-vaginal septum corresponding to the normal situation of the left ureteral orifice; here an opening was made into the bladder, through which the ureter was turned in after the redundant portion was excised. Its extremity was united to the edge of the vesical mucosa at the inner border of the perforation by cotton sutures, and the vaginal edges of the mucosa were then drawn together around the ureter by silver wire; for eight days the bladder and vagina were washed out two or three times a day and the catheter used every four hours. The result was entirely satisfactory.

DISEASES AND INJURIES OF THE URETERS.

Stone in the Ureter.—A calculus may pass through the canal and do but slight injury to its mucous membrane, or it may cause deep abrasions or become lodged in the tube. When a stone is arrested in its descent, it lodges most commonly either about two inches below the kidney, at the constriction of Bruce Clark, or at the vesical orifice of the ureter. Ureteritis follows, and, if the obstruction be not relieved, hydronephrosis and destruction of the kidney result.

Symptoms and Signs.—Renal colic ensues when a stone enters the ureter. The attack sets in abruptly, without apparent cause, or may be initiated by sudden muscular effort. It is characterized by agonizing pain, which starts in the flank of the affected side and passes down the ureter. Vomiting occurs during the painful paroxysms. Micturition is frequent, occasionally painful, and the urine is sometimes bloody. There is usually tenderness on the affected side. In very thin persons it may be possible

on abdominal palpation along the course of the ureter to feel the stone *in situ.* When arrested in the pelvic portion, the stone may be located by palpation through the rectum.

Treatment.—When the obstruction is complete, as shown by negative catheterization of the affected ureter, the removal of the obstruction is indicated. A calculus in the intra-pelvic portion of the ureter may be reached by incision through the vagina, through the abdominal wall, or by Kraske's method of sacral resection. When the stone lodges in the extra-pelvic portion of the ureter, the extra-peritoneal method of removal is advised by Van Hook and by Fenger as the easiest and safest procedure. In exceptional instances it may be necessary to open the peritoneal cavity for the purpose of locating the stone. Its seat once determined, its removal is to be accomplished by the retro-peritoneal route. Intra-peritoneal ureterotomy is to be done only when the foregoing method is impracticable. The ureteral incision is closed by immediate suture. In case the parts have sustained serious injury from pressure of the calculus and consequent inflammatory changes, limited resection of the tube and restoration of its continuity by Van Hook's method of anastomosis are justifiable. Cabot believes that, by a properly selected operation, a stone can be removed from any part of the ureter by an extra-peritoneal incision. The management of the ureteritis after passage of the stone consists in flushing the urinary tract with diluents. Boro-citrate of magnesium, in doses of one drachm in a glass of warm water three times a day on an empty stomach, is recommended by Harrison.

Obstruction of the Ureter may exceptionally occur from compression in pelvic cellulitis or peritonitis. The pressure of pelvic neoplasms, such as uterine fibromata, and especially carcinomatous disease of the uterus extending into the broad ligaments, may lead to occlusion, with grave and even fatal consequences.

Symptoms.—The symptoms produced are pain in the course of the ureter above the point of obstruction, and tenderness on pressure. The kidney on the affected side is generally found to be sensitive on bimanual palpation. The ureteral catheter is arrested at the seat of obstruction, or if, perchance, it can be passed beyond the point of constriction, a quantity of decomposing urine will be evacuated from the distended ureter.

Treatment.—When the obstruction is the result of previous pelvic inflammation, ureteral catheterization and gradual dilatation of the ureter with bougies may give relief if the structural changes in the kidneys be not too far advanced. In malignant disease treatment is futile. In case of a myoma impacted in the pelvis, and incapable of dislodgement, myomectomy or hysterectomy is indicated.

Ureteritis may occur by extension of the inflammatory process from the bladder, from the kidney, or from the surrounding structures, or may arise from causes which reside in the ureter itself. The disease may be septic, gonorrhœal, or tubercular in character, and may affect one or both

ureters.   The ureter is thickened and its lumen sometimes irregularly con-
tracted.   In severe inflammation the process may extend to the surrounding
connective tissue,—periureteritis.

In rare instances the ureters may be injured during the passage of the
foetal head through the pelvis.   Vesical injuries during labor are most
likely to occur in unskilful forceps or other instrumental deliveries, and
especially in primiparæ.   If the forceps be applied before the head has
engaged and when dilatation of the cervix is incomplete, the bladder and
ureters are liable to be carried down in advance of the descending head
and to sustain injury from pressure.

In a post-partum case of uretero-pyelitis occurring in the practice of
the writer, the cystoscope revealed a fissure of the vesical mucosa at the
orifice of the inflamed ureter, the infection of which by a catheter was
believed to have been the source of the ureteral inflammation.

Symptoms and Signs.—The most constant symptom of ureteritis is
frequent micturition.   There is sharp, burning pain over the ureter, most
commonly on the left side.   Pain is increased during menstruation, and
is sometimes so intense that the patient is confined to her bed.   A curious
symptom mentioned by Mann[1] is a distaste for water.   The urine is fre-
quently scanty, is of a highly acid reaction in the absence of cystitis, and
it contains pus and blood ; the presence of pus without excess of mucus
is almost diagnostic of ureteritis.   On palpation through the vagina, the
ureters are found thickened, tender, and sometimes sacculated.   The patient
complains of severe pain and desire to urinate when the inflamed ureter
is pressed under the finger.   By cystoscopy or by ureteral catheterization
the urine from the affected ureter is shown to be purulent.

According to Skene,[2] the history in cases following obstetric injuries is
that of pelvic pain and tenderness in the lower abdomen, which at first may
not be severe.   Usually the symptoms become more acute after a time, the
pain and tenderness increasing rather abruptly.   A chill or rigor may occur,
with some tympanitic distention of the bowel, and the temperature may rise
to 102° or even 105° F., with corresponding acceleration of the pulse.   The
tenderness is markedly increased on pressure, and bimanual manipulation
on the affected side causes distress rather than acute pain.   These symp-
toms increase in severity in from three to five days, and soon thereafter pus
and blood may be found in the urine.   With the appearance of purulent
urine the patient's condition generally improves, pain and tenderness are
to some extent relieved, the pulse becomes less rapid, and the temperature
falls.   Tube-casts may sometimes be found in the urine.   The bleeding
subsides in a few days, but the pus-discharge continues for a week or
more.   In other cases the inflammation pursues a different course, and
about the time that pus appears in the urine and is discharged from the

---

[1] Transactions of the American Gynæcological Society, 1894.
[2] Ibid., vol. xv.

bladder, acute disease of the kidney supervenes, with diminution of the urinary secretion and varying degrees of uræmic intoxication.

Treatment.—The coexisting cystitis should first be treated in the usual manner. Rest in the recumbent posture should be enjoined, the bowels being freely opened with salines, morbid urinary conditions corrected, and the urine rendered antiseptic with salol. Vesical irrigation with hot acidulated water relieves the pain. A restricted diet, largely of milk, and the copious ingestion of mineral waters, like those of Vichy, Ems, and Wildungen, act favorably by flushing the urinary tract. (Skene.) Good results have been obtained by the use of high rectal enemata of water in quantities of one or two quarts. They act by their diuretic effect. (Ford.)

If there is constriction at the ureteral orifices sufficient to cause hydroureter, catheterization, followed by dilatation with bougies, is indicated. Bozeman makes a large opening in the base of the bladder in the region of the ureter and brings it under direct observation; he then passes a catheter, and through it irrigates the ureter and pelvis of the kidney with a bland antiseptic solution. With the use of Kelly's urethral speculum, or by direct catheterization per urethram, the vesico-vaginal incision is unnecessary and the technique of ureteral irrigation greatly simplified. The ureteral injections are repeated at suitable intervals till the urine comes away clear from the ureter.

Operative and other Injuries.—The ureter is liable to injury in abdominal operations upon the pelvic viscera and in vaginal hysterectomy. Cushing,[1] while extirpating a soft myoma in the broad ligament, cut one ureter and united the severed ends with two silk sutures and one catgut suture, then packed the wound and drained with gauze. A small fistula remained; it subsequently closed, however, and the patient ultimately made a complete recovery. In a case recently reported, Dr. H. A. Kelly,[2] during an operation for the removal of a large uterine myoma, doubly ligated and cut the right ureter. The tube became enlarged to about four times its normal calibre, forming a well-marked hydro-ureter. He succeeded in re-establishing the ureteral function by Van Hook's method of anastomosis. After ligating the end of the lower segment of the ureter close to its cut extremity, he made a longitudinal slit one centimetre in length in its anterior wall, half a centimetre below the ligature. A fine silk suture was then passed through the posterior wall of the lower portion from without inward, half a centimetre below the lower angle of the slit; this was brought out through the slit and caught in the outer coats of the upper portion of the ureter, two millimetres from its end, and then carried back into the slit, emerging through the wall of the ureter close to the original point of entrance. A second suture was passed at a point directly opposite, catching the upper end in a similar manner. By making traction

---

[1] Boston Medical and Surgical Journal, January, 1894.
[2] Annals of Surgery, January, 1894.

on these sutures while holding the slit open, the upper end of the ureter was readily invaginated into the lower. These sutures were snugly tied, and, in order to avoid the risk of urine backing up through the slit, the edges were sutured to the intussuscepted ureter with about ten fine silk interrupted rectangular sutures, catching only the outer coats.

The general principles of treatment in ureteral injuries, as laid down by Van Hook,[1] are as follows. The extra-pelvic portion of the ureter is most readily and safely accessible for surgical treatment by the retro-peritoneal route ; hence all operations upon the ureters above the crossing of the iliac arteries should be performed retro-peritoneally, except in those cases in which the necessity for the ureteral operation arises during laparotomy.

The intra-pelvic portion may be reached by incision through the abdominal wall, through the bladder, through the vagina, or by Kraske's sacral method, according to the location of the injury.

The chemical composition and reaction of the urine must be studied in all injuries to the ureter, the urine being rendered acid, if possible, and the specific gravity kept low. In all injuries where the urine is septic before the operation, or where the wound is infected during the operation, drainage must be effected.

In aseptic longitudinal wounds of the ureter occurring in the course of cœliotomy, suture may be practised and the peritoneum protected by suture. Transverse wounds of the ureter involving less than one-third of the circumference of the duct should be treated by free drainage (extra-peritoneal), and not by suture. In transverse injuries in the continuity of the ureter involving more than one-third of the circumference of the duct, stricture by subsequent scar-contraction should be anticipated by converting the transverse into a longitudinal wound and introducing longitudinal sutures.

In complete transverse wounds of the ureter at the pelvis of the kidney, sutures may be used if the line of union be made as great as possible. In complete transverse injuries of the ureter in continuity, union must not be attempted by suture. In these cases union without subsequent scar-contraction may be obtained by Van Hook's method of lateral implantation. In complete transverse injuries of the ureter very near the bladder, the duct may be implanted, but with less advantage, into the bladder directly.

At the pelvis of the ureter, continuity after complete transverse injury may be restored by Kuester's method of suture, provided the severed ends can be approximated by slightly loosening the ureter from its attachments. Rydgier's method of ureteroplasty in such injuries may be tried if other methods cannot be utilized. The primary operation should at least fix the ends of the tube as nearly as possible together.

In both trans-peritoneal and retro-peritoneal operations the ureteral ends can be approximated by Van Hook's method, even after the loss of about

---

[1] Transactions of the American Medical Association, 1893.

an inch of its substance. The use of tubes of glass and other materials for the production of channels to do duty in place of destroyed ureteral substance must be rarely satisfactory, and, even if temporarily successful, the duct is almost sure to be choked by scar-contraction.

In injuries of the portion of the ureter within the pelvis, with loss of substance, the ureter should be treated as follows. If possible, the continuity of the ureter should be restored by Van Hook's method. If this be not possible, the ureter, if injured in vaginal operations, should be sutured to the base of the bladder with a covering of mucous membrane so far as possible, with a view to future implantation or formation of vesico-vaginal fistula with kolpokleisis.

In injuries to the pelvic ureter during cœliotomy, where the continuity cannot be restored, and where temporary vaginal implantation cannot be effected, the proximal extremity of the duct should be fastened to the skin at the nearest point to the bladder.

Implantation of one or both ureters into the rectum is absolutely unjustifiable under all circumstances, because (1) the primary risk is too great; (2) there is great liability to stenosis of the duct at the point of implantation; (3) suppurative uretero-nephritis is almost certain to occur either immediately or after the lapse of months or years.

Extirpation of a normal kidney for injury or disease of the ureter is utterly unjustifiable, except where the ureter cannot be restored in one or other of the ways cited.

CHAPTER XVII.

DISEASES OF THE RECTUM AND ANUS.

BY EDWARD E. MONTGOMERY, M.D.

Anatomy.—The rectum is continuous with the sigmoid flexure. Commencing at the left sacro-iliac synchondrosis, it follows the concavity of the sacrum towards the median line, crosses over the third section of the sacrum to the right side of the pelvis, recrosses the median line and inclines slightly to the left, and again follows the median line down to the anus. Its antero-posterior curvature is like that of an S whose upper concavity is parallel with that of the sacrum and whose lower faces the coccyx. It presents two transverse curvatures, the first looking to the left, the second and smaller to the right. The upper portion of the rectum is completely invested with peritoneum; as it proceeds downward, the mesorectum disappears. Below the cul-de-sac of Douglas there is no peritoneal covering whatever, the rectum being in relation here anteriorly to the wall of the vagina and posteriorly to the coccyx and levator ani, laterally to cellular tissue. The envelopment of peritoneum forming what is known as the mesorectum permits a certain mobility of the superior part of the canal and admits of its possible displacement. As the mesorectum disappears, the union between the rectum and the sacrum becomes more complete, and this portion of the intestine is less distended. In one case under the writer's observation the displacement of the upper part of the rectum produced a condition of obstruction similar to that in an old, weakened garden-hose where a twist or bend occurs, so that the patient would suffer from severe attacks of flatulent distention until the gas would apparently overcome the kinking in the tube. In its lower part the intimate relation of the rectum with the vagina is of great importance in digital examination and diagnosis, since through the anus we may be able to explore indirectly the uterus, vagina, and pelvic cavity, while from a surgical stand-point its close association may be the cause of danger from wounds in operations upon the posterior wall of the vagina and in injuries to the parturient canal.

The rectum consists in its upper part of the peritoneal, muscular, and mucous coats; in its lower part, of the muscular and mucous coats alone. It consists of a double muscular tunic. The first layer is superficial and longitudinal, though the fibres terminate in a reflection at the level of the perineal elevators, increasing the pelvic aponeurosis. Other fibres blend

with those of the perineal elevators; the latter finally terminate in the skin at the circumference of the anus. Beneath the longitudinal fibres is a second tunic of circular fibres, which terminate at the level of the anus by a fillet constituting the internal sphincter, essentially distinct from the external sphincter, which is composed of striated fibres. Between the muscular and mucous coats is a cellular layer which is continuous throughout the intestinal tract and renders the mucous layer movable. This movement of the mucous membrane becomes pathological in cases of rectal prolapse. The mucous membrane is destitute of papillæ, and is covered by cylindrical epithelium rich in glands and tubes. At the junction of the inferior and middle thirds is a fold of the mucous membrane, known as Houston's valve, which is recognized by the finger in ano-rectal exploration.

Anus.—The anus is the termination of the alimentary canal, and in its description we must take into consideration its orifice and the two sphincters which control it. The orifice is in reality a circular canal with its circumference puckered into folds. Normally, and when not subject to strain, it is closed. A number of folds will be seen radiating from the centre towards the circumference, and are disclosed by gentle traction upon the orifice. The mucous lining is rose-colored, and is found upon close examination to present a number of vertical folds, called the columns of the rectum. Between these are valvular folds which resemble somewhat in appearance the aortic valves. These small pouches may be the starting-point of suppuration due to irritation from the presence of foreign bodies. The external sphincter surrounds the orifice of the anus, and has fixed attachments which correspond to fibrous bands passing from the anal orifice to the tip of the coccyx and anteriorly to the superficial perineal fascia. Its fibres blend with those of the sphincter vaginæ, constituting a figure-of-eight muscle which surrounds the vagina and anus, while the internal sphincter is formed by the lower circular fibres of the muscular coat, which are more developed at this point. The internal sphincter is a little over an inch and a half in breadth, being overlapped by the external. The anus is about three-fourths of an inch in length, presenting a puckered or wrinkled orifice caused by the sphincter. The border-line between the skin and the mucosa is distinguished by a fine white streak indicating the interval between the external and the internal sphincter. The anal branch of the pudic nerve supplies the skin at the verge of the anus: hence pain from anal fissure is due to an exposed filament of this nerve.

Physiology.—When at rest the sphincters are constantly on guard and keep the orifice closed. If the patient has a lesion of the dorsal cord, they become relaxed and there is incontinence of fæces. The act of defecation has for its origin a vague sensation of weight, due to the pressure exercised upon the anus by a fæcal mass. This sensation induces a reflex contraction of the muscular tunic of the rectum which tends to force towards the anus the accumulated material. If the sphincters offer resistance, an anti-peristaltic action results, pushing the fæcal matter towards the

upper part of the rectum. The tonicity of the sphincter, however, has a limit, which is overcome when the column formed by the fæcal material is high. In such cases a single peristaltic movement of the intestines is sufficient for the act of defecation, by which the latter is accomplished in the ordinary cases. If the material becomes solid, it requires a severe muscular effort for relief.

<h3 style="text-align:center">INJURIES.</h3>

Injuries of the rectum are of two kinds, accidental and surgical. The former are generally rare, on account of the protection of the rectum by the sacrum. The causes of injuries vary, as falling from a height on a pointed body, sliding off a hay-rick upon the point of a fork or fork-handle, the careless use of a sound or the tip of a syringe. Perforation or rupture of the rectum may occur spontaneously, as in the fœtus; straining at stool may cause partial rupture of the rectal wall. Parturition is a well-known cause. Prolonged use of a metallic or hard-rubber pessary may cause a fissure and finally a wound of the septum; the latter is generally slight or superficial. The symptoms of such an injury are localized pain and discharge of blood and muco-pus.

Peritonitis may sometimes complicate wounds of the rectum. The inflammation is usually circumscribed, and is not serious. When peritonitis occurs, it is apt to be acute in character, and the patient succumbs in a few days. Perirectal phlegmon is a less serious complication, and generally ends in the formation of a fistula. Emphysema has been mentioned, but is rare. The extent and depth of these wounds are exceedingly variable. One may be superficial, while in another there may be considerable destruction of tissue.

The diagnosis is usually determined by the symptoms, as local pain, discharge of blood, and later muco-purulent material, by the anus; and to these signs may be added others, as the passage of fæcal matter through the vagina, or with the urine, or the escape of urine by the rectum. Hemorrhage itself is a symptom of sufficient significance to demand interference. When it is severe, the loss of blood may be sufficient to cause syncope. Such injuries are sometimes complicated by peritonitis. If the inflammation extends gradually, it may be circumscribed and may not be grave, unless the peritoneum has been injured and there is a communication with the bladder or the rectum; peritonitis then becomes of a very acute character, and the patient rapidly succumbs. A much less significant complication is perirectal phlegmon, which generally terminates in the formation of a fistula. The condition described as emphysema is exceedingly rare, and results from perforations of the rectum; it may assume alarming proportions, as in a case reported in the *Lancet*, where it had extended over all the lower portion of the body.

The prognosis will depend entirely upon the situation, extent, and depth of the wound. Recovery in the majority of cases is the rule.

Treatment should be directed to relieving pain and possible peritoneal complications. Pain may be allayed by the use of opium; cold applications or an ice-bag may be applied over the affected region with the view of limiting inflammation. If suppuration is established in the perirectal tissue, free incisions should be made, followed by antiseptic irrigation. Hemorrhage at the time of the accident may be severe and even dangerous, requiring that an important vessel should be secured or that the cavity should be firmly packed with gauze.

<div align="center">FOREIGN BODIES.</div>

Foreign bodies in the rectum may be divided into three classes : 1, those which have been introduced through the anus; 2, those which have reached the rectum by way of the intestinal canal after they have been swallowed; 3, those which have formed in the rectum.

Where foreign bodies have been introduced through the anus the subjects are usually of depraved habits; pederasty and abnormal sexual impulses afford the motives. The character of the objects introduced is exceedingly variable, such as beer-glasses, mortar pestles, marbles, and pebbles. The length of the body introduced into the rectum has been in some cases phenomenal, and it is difficult to comprehend how an individual could insert a mortar pestle twelve inches long and three inches in thickness without producing a serious lesion. Irregular bodies which have rough, unequal surfaces give rise to erosions and sometimes to lacerations. A misplaced pessary may have produced ulceration and perforation of the recto-vaginal septum, so as to enter the rectum.

The second class of foreign bodies are those which reach the rectum through the intestinal tract. Merlin relates a case in which a fish-bone had perforated the rectal and uterine walls and implanted itself in the foetus. Other cases of this kind are false teeth, pins, or pieces of money.

The third class of foreign bodies includes those which develop in the intestine or in the rectal pouch. In children these are frequently masses of lumbricoid worms. In some cases, especially in the old or paralytic, an accumulation of excrement may form a hard mass. Such masses are found particularly in aged females, also in the hysterical. The hardened fæcal matter may be covered with a whitish coating and may present the character of a true concretion or calculus. In the middle of such a compact mass may be found smaller portions which have had for their point of origin a biliary calculus or the stone of a cherry or prune. The true cause of the accumulation is the diminished reflex power in the large intestine and the defective contraction of the muscular fibre, with the presence of a retained hard fæcal mass which acts upon the formation of the structure of the rectal surface. Dilatation of the rectum about a fæcal calculus occurs, and finally an ulcerative proctitis constitutes the characteristic lesion.

The symptoms are those which arise from the accumulation of fæces, also the pain produced by proctitis, a sensation of weight on the perineum,

sero-sanguinolent diarrhœa which is quite fetid, but, most important of all, constipation. Lumbar and crural pains are present, with a frequent desire to defecate, which proves fruitless; sometimes dry, almost petrified, scybala are expelled. Straining and efforts at evacuation are laborious and painful. Prolonged retention of fæcal matter reacts badly upon the general health, causing toxæmia, digestive disturbance, hepatic pain, and nervous irritability.

If the condition arises as the result of a true foreign body in the rectum, the symptoms are more acute and severe. After about forty-eight hours, or rarely later, the patient is forced to seek surgical intervention, and will complain of pretty severe pain in the belly and a sensation of weight at the level of the anus. Not infrequently there is inflammation of the bladder and uterus. If the object has been pushed deeply and roughly into the rectum, the peritoneum may become inflamed. Prolonged retention of a foreign body in the rectum may cause inflammation or even gangrene of its walls, pelvic cellulitis, hypogastric phlegmon, abortion, and intestinal obstruction.

The diagnosis is sometimes very difficult, and when exact information is wanting, the rectum should be palpated if a patient complains of obstinate constipation, with pain in the region of the rectum, perineum, and base of the bladder. In some cases two fingers, or the entire hand, if small, may be introduced into the rectum, when a foreign body may be detected as high as the sigmoid flexure.

The prognosis is generally favorable, and will depend somewhat upon the character of the body and how it has been introduced. If it is fragile or sharp, and has been introduced through the anus, its removal may be attended with difficulty.

The treatment is necessarily varied. In some cases it requires all the surgeon's ingenuity to accomplish the successful removal of the body. The celebrated case of Marchetti's should be kept in mind, where a pig's tail, rough with bristles, was pushed into the rectum of a public woman by some students during an orgy. The more the tail was pulled the more forcibly were the bristles driven into the mucous membrane and the greater was the difficulty of its removal. It was withdrawn by passing over a string attached to the tail a hollow reed, which pushed the mucous membrane off the surface and permitted the removal of the foreign body. Where the body is situated high up, it may be necessary to resort to abdominal section and to accomplish its removal by incision of the intestine and subsequent suture. In some cases a posterior rectotomy may be sufficient.

ANAL PRURITUS.

Anal pruritus is an intermittent or continuous itching of the anal region. It may be so severe as to produce prolonged insomnia and constitute a most distressing malady. The itching may be so intense that the patient cannot avoid scratching the parts, even though she may be so situated as to make

it extremely annoying. Pruritus may be divided, according to its cause, into parasitic, secondary, and essential pruritus. The most frequent cause is the *oxyuris vermicularis*, a form of intestinal worm about two-fifths of an inch in length, resembling a large white thread. It is readily seen with the naked eye when we examine the anus. The mere exploration is not always sufficient. If it is not observed at the first examination, it is well to make two or three, and even to inspect the fæces. Secondary pruritus is observed as a sequela of hemorrhoids, erythema, eczema, or herpes. In a word, it is the result of any affection which can cause irritation of the anal region. The cause can be readily determined by direct examination. Essential pruritus differs from the others in that there is no trace of any parasite or any pathological lesion. It is, then, due to a simple neuralgia or dermatalgia. It is only in the absence of any appreciable cause that this variety is admitted.

The treatment must necessarily depend upon the cause. In the parasitic form the margin of the anus should be frequently washed with a sublimate solution (1 to 1000), or with equal parts of water and ordinary vinegar, or with carbolic acid one part, glycerin twenty parts, infusion of absinthe one hundred and twenty-five parts. In secondary pruritus the cause of the affection should be treated by the appropriate remedy. In essential pruritus, apply hot lotions several times a day, or use a ten-per-cent. cocaine ointment, or try cauterization of the margin of the anus, morphine suppositories, and, if necessary, dilatation under chloroform anæsthesia.

FISSURE OF THE ANUS.

By this name is designated a small superficial excoriation seated between the radiating folds, which gives rise to sharp pain and spasmodic contraction of the sphincter. It is produced by habitual constipation. Hard fæcal matter cannot pass over the anal region without causing erosions or tears of the membrane. In some cases, in addition to the fissures and hemorrhoids, eczema and erythema exist, and to these conditions and the reflex contraction of the sphincters has been attributed the constipation; in others, congenital narrowing of the anus has been mentioned as a cause.

Fissures have been divided into two classes, the tolerable and the intolerable, the former being almost devoid of pain, the latter producing acute suffering. The pain attains its most severe paroxysm at the moment of defecation, but gradually subsides at the end of twenty to twenty-five minutes. The patient has an acute lancinating pain at the anus, a pricking, burning sensation with radiating pains in the loins, thighs, and lumbar regions. Patients may be confined to bed, not daring to make a movement. At times they assume the strangest postures in order to compress the anus, sitting on the edge of a chair, etc. In some the distress during defecation is so acute that they avoid going to the closet. As a result, obstinate constipation occurs, with gastralgia, disturbance of the digestive functions, stercoræmia, loss of flesh and appetite, and an altera-

tion of the tissues which may resemble an actual cachexia. The acute stage may be complicated with colic, vesical spasms, and crural and sciatic neuralgia.

It is generally easy to recognize the existence of the ,fissure by mere inspection. The little muco-cutaneous processes called anal valves, and the pouches behind them, known as the sinuses of Valsalva, are often the sites of fissures. In these cases there will be a small external pile at the bottom of the sinus. It is sometimes called the "sentinel" pile. In some cases we may not be able to discover the fissure. We may then move the finger around the anal orifice and determine its site by the localized pain. If the patient strains, the rectal mucous membrane protrudes and the ulceration is disclosed. When the fissure has existed for some time, anal vegetations may develop in its neighborhood which may conceal it and lead to error. It is difficult to confound a fissure with hemorrhoids or vegetations. The only condition in which there may be the possibility of error is the affection known as neuralgia of the anus. In it, however, the pain appears spontaneously, and does not necessarily occur at the time of defecation.

The treatment may be palliative or curative. The former consists in the use of baths and ointments, particularly iodoform or ichthyol ointment; ichthyol is said to exert a marked curative effect in anal fissure. The radical treatment of fissure, however, is surgical, and consists in dilatation of the sphincter, either by the aid of bougies or by the introduction of the thumbs or two fingers through the sphincter, and their forcible separation, the patient being thoroughly anæsthetized.

PROCTITIS.

Proctitis is an inflammation of the mucous membrane of the rectum. It is generally concomitant with or consecutive to inflammation of the large intestine, but may appear independently, being sometimes acute and sometimes chronic. Among the causes of proctitis are inflamed hemorrhoids, inflammation of the mucous surface of the anus, blennorrhagia, the abuse of drastics, obstinate constipation, foreign bodies, as fish-bones, biliary concretions, worms, and the practice of pederasty. The condition may be developed by careless methods of examination. Hence, in making a vaginal examination, the rule should always be to wash carefully the finger before inserting it into the rectum, as through any specific discharge from the vagina an infection of the rectum may be very readily accomplished, producing gonorrhœa.

The symptoms are local, being confined to the inferior part of the digestive tube. Little by little the patients experience painful sensations in the region of the sacrum, coccyx, bladder, and uterus. The anus becomes red, hot, very sensitive, and contraction of the sphincter occurs. It is accompanied by constipation, which may persist during several days. Evacuations soon become painful, followed by tenesmus and the expulsion of a glairy mucus or of a mixture of pus and mucus, and sometimes of blood. After

this first period comes another, characterized by profuse diarrhœa and mucous or muco-purulent discharge. In neglected or badly treated cases acute proctitis soon becomes chronic, the symptoms being somewhat similar in character to those already described. Diarrhœa alternates with constipation. Examination by the speculum will disclose the presence of multiple points of ulceration, which are rounded and superficial, or extensive vegetations, the latter specially marked in cases of blennorrhagic proctitis. The thick, greenish discharge attending this condition becomes the point of departure for a series of complications. It produces a red appearance, excoriation, and even an eczematous eruption of the perineum; the mucous membrane itself becomes altered, thickened, sclerosed, and narrowing of the rectum may result. In severe cases we sometimes see phlegmons, abscesses, and fistulæ complicating the intense inflammation of the rectum.

The disease is not usually difficult to recognize. It is characterized by constipation, with sharp pain during defecation, and a rise of temperature, followed by a mucous discharge and tenesmus. In dysentery, the frequency of the stools, hemorrhages, and the expulsion of shreds of mucous membrane are symptoms too characteristic to be confounded with simple proctitis.

The treatment consists in rest, the use of enemata of hot water or astringent injections, such as one-half to one grain of sulphate of zinc to an ounce, nitrate of silver, one-eighth to one-fourth of a grain to the ounce, or some of the vegetable astringents, as tannic acid, fluid extract of hamamelis, or fluid extract of hydrastis. A five-grain iodoform suppository, used twice daily after irrigation of the canal with either hot water or some astringent agent, will be found useful. A combination of extract of belladonna or extract of hyoscyamus with the iodoform is often beneficial, particularly where there is much tenesmus.

PHLEGMONS OR ABSCESSES OF THE ANUS AND RECTUM.

Phlegmons and abscesses of this region may be divided into three classes: 1, the superficial inflammations of the anal region and of the rectum; 2, those which have their origin in the ischio-rectal fossa; 3, those which are developed in the cellular tissue beneath the peritoneum and under the levator ani muscle. The causes of the development or extension of phlegmon are quite various. It may be due to scratching of the anal region, to uncleanliness, or to blennorrhagic discharges from the vaginal cavity. These are not slow in producing excoriations. The passage of hard fæcal matter is also an etiological factor. The cause of the deep ischio-rectal variety is often difficult to determine. Many of these abscesses arise as the result of a local development of tuberculosis. In other cases they may be produced by ulceration, proctitis, cancer, stricture, inflamed hemorrhoids, and, finally, surgical intervention, such as dilatation of the rectum, excision of condylomata, hemorrhoids, or other tumors. Superficial inflammations comprise superficial abscess and phlegmonous abscess, or phlegmon proper. Superficial abscess presents the fol-

lowing appearance. There is generally a tumor the size of a hazel-nut, of a light-red color, which, on examination, is found to be superficial and limited by a circumscribed induration. At the end of a few days the tumor, after the patient has suffered more or less acute pain, becomes soft and fluctuating, the skin reddens and becomes thin, and there is a discharge of very fetid pus. The tension ceases, pain disappears, and all that remains of the abscess is a small induration.

It is only necessary to recall the signs that have been mentioned to enable us to avoid error in diagnosis. The affection is one of slight gravity, and generally disappears quickly. When a small abscess, however, is developed at the expense of tuberculous tissue, it often persists for a long time as a small fistula, from which a serous or sero-purulent liquid is discharged.

The proper treatment before suppuration occurs is the application of cold and the regulation of the bowels. If suppuration is imminent, it may be promoted by the application of starch poultices, and when fluctuation is established the abscess should be incised.

Phlegmon.—Phlegmon is situated at the margin of the anus, and is the form which we meet most often. This inflammation occurs in the subcutaneous cellular tissue, but, instead of being circumscribed, it has a tendency to spread over the surface. Later the patient has a sensation of tension in the region of the anus, followed by swelling and painful defecation. Fluctuation will be very clear, with the aid of one finger introduced into the rectum while the other is applied externally. These abscesses are not infrequently followed by fistula.

The abscess should be opened early by a long, deep incision, then irrigated with a strong carbolic solution or with a solution of chloride of zinc. If there is a fistulous opening into the rectum, a director should be introduced into it and all the tissue should be incised, including the sphincter.

Abscess of the ischio-rectal fossa is generally obscure at the outset. If a large collection of pus develops in the perineal region, it travels over the anus towards the sacrum and from the anterior part of the perineum towards the coccyx; the integument becomes hard and thickened, and forms a sort of resisting shield. Pus destroys the deep layers of tissue, and spreads along the large ligaments towards the ischial tuberosities. As in all suppurations in close proximity to the intestine, the pus becomes exceedingly fetid. It finds a considerable obstacle in the levator ani muscle and the thick skin, passes towards the rectum, and, after having destroyed the external layers of the gut, may collect under the mucous membrane. The collection may take place in the ischio-rectal fossa, and may communicate with the abscess upon the opposite side. This condition is known as circular or horseshoe abscess, and permits the pus to flow from one sac to the other. In some cases these abscesses may point beneath the skin, and the patient has a high fever, frequent pulse, delirium, sometimes collapse, and the condition terminates fatally after several days. Gangrene of the ischio-

rectal fossa may occur, generally due to the infiltration of fæcal matter or urine. The skin rapidly assumes a dark tint, and bluish spots and large blisters cover the surface; from the latter very fetid pus escapes, mixed with bubbles of gas. In certain grave cases the rectal wall is also affected by gangrene, the patient having prostration, delirium, dryness of the tongue, and an extremely profuse and fetid diarrhœa.

The condition is not generally difficult to recognize. Rectal touch discloses perirectal induration, which does not extend much beyond the levator ani.

The condition is very grave. Complications may bring death with but brief delay.

The treatment should be prompt and energetic. A deep incision should be made. This may be accomplished with the thermo-cautery, and should be followed by irrigation with an antiseptic solution, or even by cauterization with chloride of zinc.

Abscess of the Superior Pelvi-Rectal Spaces.—We have been discussing inflammation of the cellular tissue beneath the muscular band constituted by the levator ani muscle. We now come to the consideration of phlegmons which are situated in that space, full of cellular tissue, limited above by the pelvic peritoneum and behind by the superior faces of the levator muscle, covered with its aponeurosis. The anatomical relations of the bladder, uterus, and rectum explain the reason of phlegmons in this region, of which some are the result of affections of the genital organs and others may owe their origin to ulceration of the rectum or inflammation of the hemorrhoidal veins. Caries of the anterior face of the sacrum and sacro-iliac arthritis may also be the point of departure for pelvic suppuration.

The symptoms are often obscure. The affection, in its beginning, is insidious. Patients complain of a sensation of weight in the pelvis, sometimes an actual pain which they can hardly localize. They suffer from constipation, difficulty in evacuating the bowels, and a general uneasiness, associated with fever. The progress of the affection varies. Sometimes pus collects in, and separates the fibres of, the levator muscle, and makes its way towards the ischio-rectal fossa. It there forms an abscess, which at a later period opens externally; the resulting fistulous tract may measure from three to five inches. At other times the purulent collection empties into the rectum and thus establishes a symptomatic diarrhœa. Patients who have before complained of obstinate constipation and painful stools have diarrhœa associated with the ejection of a considerable quantity of pus. The evacuation of the pus-cavity, however, is imperfect; the orifice of communication is generally small, and the abscess tends to become chronic. In some cases the pus passes beneath the pelvic aponeurosis and discharges into the vagina or bladder, though it is clear that it originated high up in the perirectal tissues. The only method by which we can approximate its position is by the rectal touch.

The treatment should consist in opening the abscess through the rectum

at the site of the enlargement, and the incision should be made as free as possible.

FISTULA IN ANO.

A fistula is a narrow canal or sinus which connects two neighboring regions that are separated in the normal state. Fistulæ may be divided into—1, complete (Fig. 1, *A*), or a sinus with an opening upon the mucous membrane and another externally,—in other words, a continuous canal; 2, incomplete (*a*) blind external (Fig. 1, *C*), in which there is no communication with the rectum, and (*b*) blind internal (Fig. 1, *B*), which open upon the surface of the mucous membrane only. From a pathological stand-point they may be divided into—1, fistulæ which are sequelæ of inflammation of the cellular

FIG. 1.

Varieties of fistulæ.—A, complete fistula: B, blind internal fistula; C, blind external fistula.

tissue of the pelvi-rectal fossa, as the common anal fistula; 2, fistulæ which have for their source suppuration in the adipose layer of the superior pelvi-rectal space, and are known, consequently, as superior pelvi-rectal fistulæ; 3, fistulæ which have their origin in a bony lesion, and are called osteopathic fistulæ. The latter need not occupy our attention.

The inferior or common anal fistulæ are the most frequent, and form the greater number of those seen in daily practice. In an ordinary fistula the tract is situated immediately beneath the integument of the anus, not involving the fibres of the sphincter muscle. Now, in the description of all fistulæ we must consider the orifices, internal and external, and the intermediate tract. The external or cutaneous orifice is more frequently at one side of the anus, and is generally single. It may be situated near to, or at some distance from, the anus, sometimes in the midst of the radiating folds. In a deep fistula, the external orifice is some distance from the termination of the digestive tube. Generally it is quite narrow, and we see it in the summit of a small projecting pimple of a reddish color or presenting a fungous aspect; at other times the orifice is concealed in the depth of an ulceration. In some cases we find in a prominence a series of straits which sometimes open into the same canal, at other times into a series of tracts communicating with the rectum. The internal or mucous orifice is sometimes situated immediately beneath the point where the skin borders the mucous membrane, but it is not always so: it may open one-fifth of an inch to two inches from the anal orifice. The appearance of the internal orifice also varies. Sometimes it is a simple opening at the level of a projection of moderate dimensions; at other times it is large and

irregular. In some cases we may find that the probe passes upward alongside the rectum, while the opening is lower down. It can generally be found just above the external sphincter or between the two sphincter muscles. The tract is sometimes straight, sometimes tortuous, having a direction from the cutaneous surface towards the rectum. When the fistula is incomplete, the canal is arrested midway. When several orifices are situated about the anus, exploration with the probe will often determine the fact that they communicate with each other. This crescentic burrowing in the vicinity of the anus has been designated by the name of the "horseshoe" fistula. In such cases the canal may attain a considerable length.

Superior pelvi-rectal fistulæ have their origin in inflammation and consecutive abscess of the cellular tissue between the levator ani and the peritoneum. The fistulous tracts in this form are often rectilinear, and quite deep,—from three and a half to six inches. In examining these fistulæ we notice that there is considerable tissue separating the finger introduced into the anus and the probe in the fistulous tract, which fact distinguishes them from ordinary fistulæ. Probably one of the most frequent causes of fistula is tuberculosis. Microscopical examination will demonstrate that the condition has arisen from a deposit of tuberculous tissue in the midst of the cellular structure, and its subsequent degeneration or necrosis, which results in the loss of normal tissue and the formation of a purulent collection, which sometimes discharges externally, sometimes into the rectum. Foreign bodies arrested at the level of the folds of the anal region, or rupture of a hemorrhoidal lobe, facilitate infection of the cellular tissue and the subsequent formation of an abscess. It has often been asked why fistulæ are so slow to heal, and why, in many cases, in spite of skilful treatment, they cicatrize so badly and leave a small tract which has no tendency to close again. This has been explained by the extreme mobility of the rectum; frequent contractions of the levator ani muscle would render cicatrization impossible or very difficult. But the tardy healing is due especially to the nature of the affection. So long as tuberculous granulations remain the fistula will not close.

Symptoms.—Patients afflicted with fistulæ complain of varying sensations. Some have pruritus, others a secretion of pus which may not be abundant, but which always has a very penetrating odor. Eczema or simple erythema may later appear about the external opening; the latter may be obliterated, and there is then retained pus and an inflammation of the tissues which renders the condition insupportable. If we examine the anal region, we find one or more small openings, the latter presenting the appearance of the head of a watering-pot. In cases of blind internal fistula there is a discharge of pus from the anus, associated with a congestion of the whole perianal region.

Diagnosis.—The patient should be placed in the lateral position, with the upper thigh strongly flexed. The parts are exposed, the superior buttock

is raised, and the anal region inspected. This sometimes suffices to determine the diagnosis of fistula. It is necessary to introduce the finger into the rectum, however, to ascertain the extent and variety of the lesion. A probe is pushed through the small papilla or projection, and is carried gently along the canal, the point being pressed against the finger in the rectum in order to locate the internal opening. This is generally found just within the margin of the external sphincter. The probe will often pass upward alongside the bowel, but if withdrawn and pressed towards the upper margin of the external sphincter it passes through the internal opening and impinges against the finger. In blind internal fistula the touch is very painful; only a small quantity of pus is discharged; the finger meets no induration, ulceration, or fungosities in the lower end of the rectum, which enables us to eliminate the probability of cancer, polypi, or cicatricial stenosis of the gut. An induration surrounding the anus renders the diagnosis of blind internal fistula probable.

Prognosis.—Such lesions are always serious; although the affection itself may not be grave, it is an indication of a bad general state, and shows that the subject is predisposed to the development of tubercle-bacilli.

Treatment.—The earlier method of treatment of such conditions (which is still preferred by some surgeons) was the application of the elastic ligature. A needle or probe, armed with a thread of caoutchouc, was passed through the internal orifice and out at the anus. The thread was tied, and it gradually cut through the tissues, cicatrization at the same time occurring behind it, so as to fill up the opening. Often after the thread disappeared the fistula persisted. In these cases it was asserted that the affected tissues were not destroyed.

Incision by the thermo-cautery is far more efficacious. The canula sound is introduced into the tract, and the finger into the rectum. Following the direction which the sound travels, the internal orifice is discovered and the canula is brought out. The tissues are then divided by the thermo-cautery, and the bottom of the wound is cauterized and covered with iodoform gauze.

The best method of procedure is to incise the tract with a bistoury, to curette and irrigate it with an antiseptic solution, and then to suture the edges of the wound. This method of procedure is by far the preferable one, particularly in the female, for the reason that the intimate arrangement and association of the sphincter ani and sphincter vaginæ muscles lead to weakening of the sphincter subsequent to incision and granulation, while suturing the wound results in its restoration to a normal condition. To accomplish this operation, however, it is important that any secondary sinuses or fistulæ should be opened up and curetted prior to the closing of the edges of the wound. In some cases where the tissue is depraved the wound fails to unite, and the subsequent condition of the patient is bad. When a number of fistulæ are opened about the anus, it is desirable that they should not be cut through, even if suturing is done, as failure to unite would result in

loss of power of the sphincter. The preferable plan in such cases would be the incision of the sinus up to the sphincter, careful curettage of the remaining portion of the canal, and packing the cavity with iodoform gauze. This plan of procedure has resulted, in the hands of the writer, in the cure of extensive fistulæ without influencing the subsequent action of the sphincter. It is important at the same time that the general health of the patient should be improved, and for this purpose cod-liver oil, creosote, phosphate of lime, iodide of potassium, and various tonics may be employed.

RECTO-VAGINAL FISTULÆ.

A recto-vaginal fistula is one which connects the rectum and the vagina. The sinus may be situated in any part of the septum. In women who

FIG. 2.
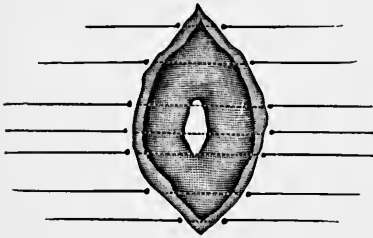
FIG. 3.

Denudation of the fistulous edges in the vagina, with introduction of transverse sutures.
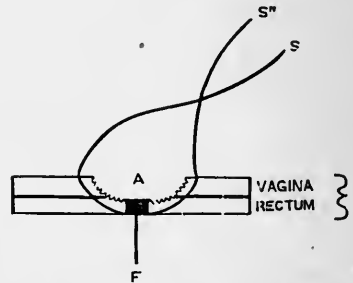
A, freshened edges; S, S, suture; F, fistula.

have borne a number of children there may be one or more openings from the rectal pouch into the lower part of the vagina. These fistulæ not

FIG. 4.
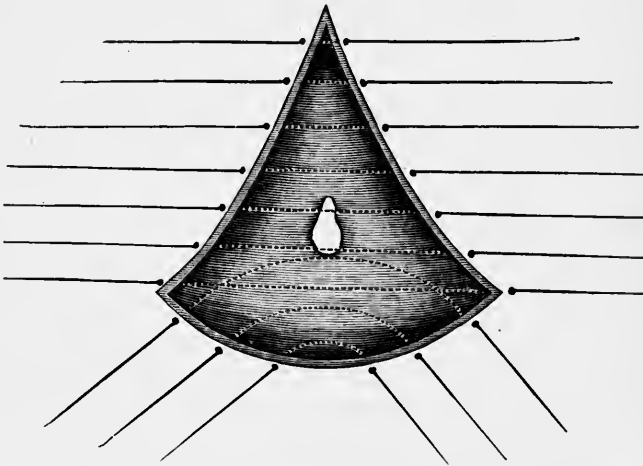
Triangular denudation. (After Schauta.)

infrequently result from the lesions of parturition, or they may be due to the same causes as ordinary fistula in ano. In all cases where the history

Fig. 5.
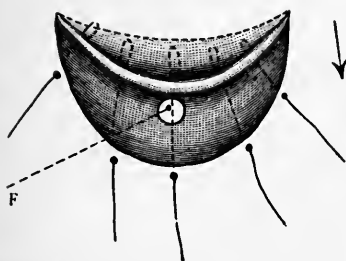
Closure of fistula by transverse crescent-shaped lips.
(After Fritsch.)

Fig. 6.
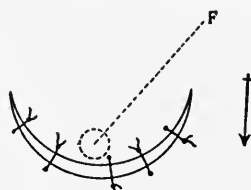
F, fistula.

Fig. 7.
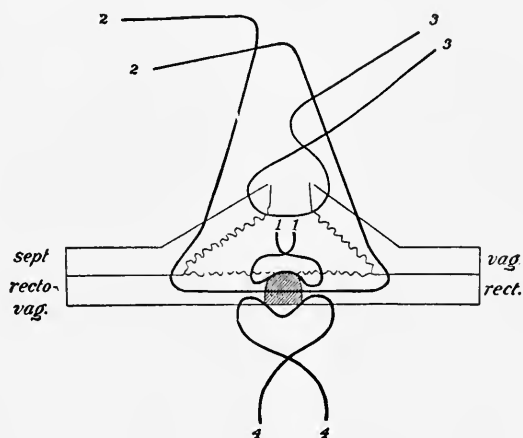
1, 1, Buried suture of the rectal surface of fistula; 2, 2, deep vaginal sutures;
3, 3, superficial vaginal sutures; 4, 4, supporting rectal sutures.

Fig. 8.
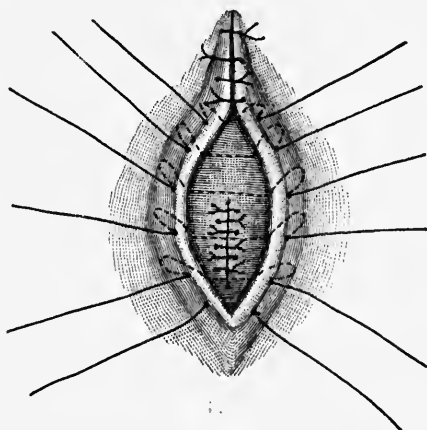
Closure of the vaginal incision by deep sutures, seen from above.

FIG. 9.
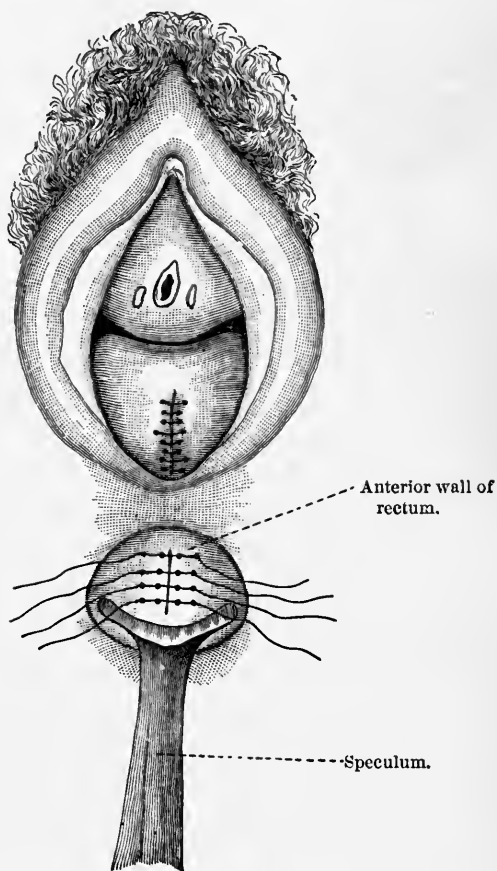
Vaginal incision closed.   Introduction of rectal sutures.   (After Saenger.)

FIG. 10.
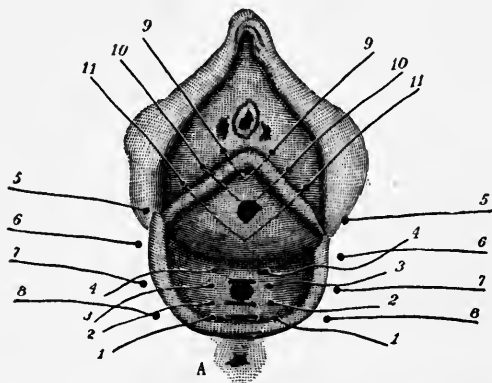
Simple perineal flap.   A, anus; 1, 2, 3, 4, Lauenstein's buried sutures for closure of the rectal fistula; 5, 6, 7, 8, perineal sutures; 9, 10, 11, vaginal sutures to close opening in the vaginal flaps.

excludes the possibility of its being a sequela of parturition, the rectum should be carefully examined for stricture.

Symptoms.—The discomfort and annoyance of such a lesion must be

Fig. 11.
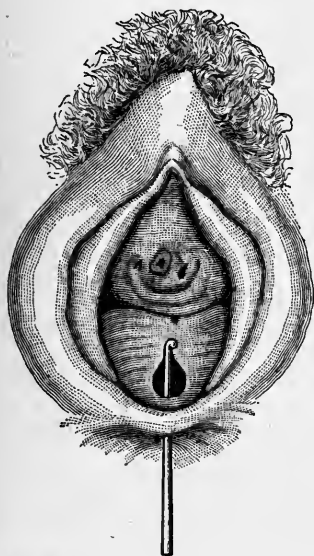
Fistula with only perineal fragment remaining.

Fig. 12.
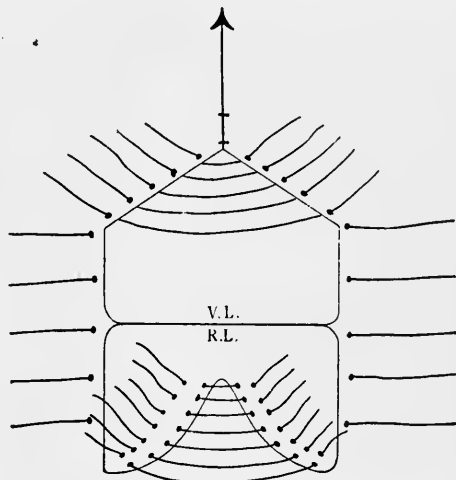
Diagrammatic representation of operation. R.L., rectal flaps, with Lauenstein's sutures; V.L., vaginal flaps.

directly dependent upon its size. The escape of flatus and liquid fæces will continually soil and render offensive the discharges of the vagina.

Diagnosis.—The position and size of the fistula will be determined by inspection, by its direction and length, and by the use of the probe. Where the odor of the discharge causes it to be suspected, and inspection does not disclose it, its presence may be revealed by distending the rectum with a colored fluid.

Treatment. — The operation for such a lesion must necessarily be dependent upon its size. When it is complicated, or is caused by stricture, no operation for its closure is indicated until the full calibre of the bowel can be restored. When the opening is small, a series of flap operations may be performed (Figs. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13), closing the opening into the rectum by buried sutures and then stitching the flap back in place.

Fig. 13.
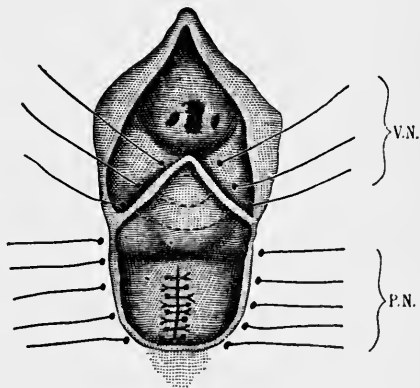
Anterior rectal wall closed by Lauenstein's deep sutures. P.N., perineal sutures; V.N., vaginal sutures.

HEMORRHOIDS.

The term hemorrhoids signifies the varicose dilatation of the veins of the anus commonly called piles. Hemorrhoids are divided into external and internal, according to their relation to the sphincter. These hemorrhoidal dilatations are ampullary (see Fig. 14), and above the sphincter

FIG. 14.

Internal and external hemorrhoids.
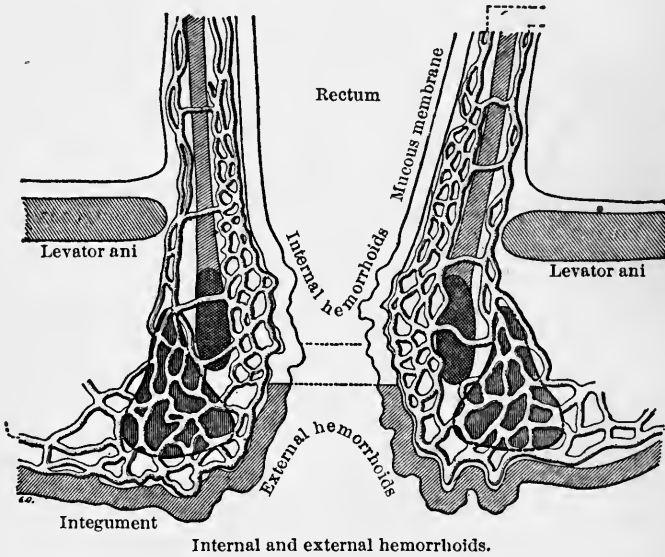
the tumor may form at the expense of the capillaries as well as of the veins. Below the level of the external sphincter, however, these ampullæ are often converted into blood-cysts. If the blood is coagulated, the hemorrhoids become hard, forming true blood-clots, which irritate by their presence the neighboring tissue, causing an indurated mass more or less extensive and the formation of small, hard tumors.

Etiology.—Hemorrhoids are a frequent affection in men, but still more so in women. They are met with especially in those of a gouty or rheumatic diathesis, and are increased under the influence of rich food, the use of alcohol, and a sedentary life. Among the most prominent exciting causes may be considered habitual constipation, the use of purgatives, and venereal excess. In women they may be developed as a result of serious mitral lesions, from the pressure of ovarian cysts, of uterine tumors, or of tumors in the walls of the pelvis, and from retroversion or retroflexion of the uterus.

Symptoms.—A great variety of symptoms may be produced by the presence of hemorrhoids; especially such as a sensation of uneasiness, pressure, twinges, tingling, and intolerable smarting, so that standing or walking becomes distressing. The patient lies in bed, sometimes upon one side, sometimes upon the abdomen, and keeps her muscles in a state of

absolute rest. Hemorrhoids are generally complicated with constipation, which aggravates the tendency to headache, vertigo, and buzzing in the ears. The patient becomes pale and loses her appetite. All these phenomena may become exaggerated when she is at the climax of suffering. Little by little the tension of the hemorrhoidal varices becomes less, pain disappears, and the patient enjoys comparative comfort. This tension may be quickly relieved by the rupture of hemorrhoidal varices, or the passage of a hard fæcal mass may cause fissure of the ano-rectal mucous membrane, with more or less abundant discharge. The anus presents a different appearance according to the situation of the lesion. Sometimes the hemorrhoid is scarcely perceptible, appearing as a slightly rounded or prolonged projection, more or less soft, smooth, and bloodless. This is the flabby hemorrhoid. Or, again, it may be tense, resisting, and painful. In some places the mucous membrane and the skin are both involved, the tumor is indurated, and resembles a true condyloma. Besides these external hemorrhoids, there are others, the true character of which can be appreciated only by the use of the speculum, when we see small, soft granular projections which the touch alone may fail to reveal. When the patient strains, these protrude from the anus; and at its level there is a double varicose enlargement, one formed by the external hemorrhoids, the other by the internal. These may be replaced with more or less facility, some without any pain, while others produce severe tenesmus. Internal hemorrhoids, when prolapsed, are grasped by the sphincter and strangulated, becoming the seat of intolerable pain. The patient has the sensation of a red-hot iron at the anus. If we examine a strangulated hemorrhoid, we find it hard and tense, purplish, brown, or even black. This change is due to an interruption of the venous circulation from the spasmodic contraction of the anal sphincter; if this continues sufficiently long, a slough is caused. At the end of some days the slough separates and the symptoms improve. Sloughing of the mass may be complicated with inflammation and suppuration of the surrounding tissue, and even with erysipelas.

The *diagnosis* of hemorrhoids is not difficult. By examination they are distinguished from condylomata, polypi, and other hard and isolated tumors. Prolapse of the rectum is characterized by a symmetrical swelling, and not by unequal projections. In cancer of the rectum there is an ulcerated fungous tumor which secretes an ichorous fluid accompanied by abundant hemorrhages, so that it would rarely be confounded with an ulcerated hemorrhoid. In examining hemorrhoids, it is important, however, always to seek for the true cause of the condition before beginning treatment, and especially to ascertain that it is not due to an affection of the liver, to a tumor of the abdominal cavity, or to a retroflexed uterus.

Treatment.—The treatment of hemorrhoids will depend upon the cause. One of the first considerations should be the correction of irregular and injurious habits. The patient should be directed to abstain from wines, liquors, spices, to overcome constipation, and to avoid the employment of

drastic purgatives. No operation should be done while the pelvis is occupied by a large fibroid or ovarian tumor, or while the uterus is retro-displaced. In many cases the treatment of these conditions will be sufficient to relieve the patient of hemorrhoids.

As to the surgical means, there are, in the first place, various drugs which are injected, such as ergot, iron, and carbolic acid. The latter agent is one which has been exceedingly popular among advertising specialists. It affords the advantage that the patients are enabled to continue their duties, and to be about, without a severe and painful surgical procedure. It is, however, proved to have been dangerous in some cases, producing extensive ulceration at the site of the operation, septic infection, and even death, by the formation of emboli. The thermo-cautery has been advocated. The chief methods of operation, however, are: 1. Ligature with incision. 2. Crushing. 3. The clamp cautery. 4. Incision.

Hemorrhoids, according to Allingham, may be divided into two classes. The first group are those which come down at stool, which are almost always in a state of prolapse, and which bleed profusely with each movement of the bowels. The operation to be chosen for such conditions should be one that can be performed as quickly as possible, so that the patient will lose little blood, with the least danger of secondary hemorrhage. The ligature meets these requirements, as it can be applied in five minutes, or even less time, and is practically free from danger of subsequent hemorrhage.

The second class of hemorrhoids are those which are regarded as producing inconvenience chiefly by protruding and preventing the patient from riding or walking. They rarely bleed, and do not impair the health. These may be crushed or cut off, bleeding vessels being ligated. Before ligating a pile, it is drawn down by volsella forceps and is separated with scissors from the muscular and subcutaneous tissues upon which it rests. The incision is made at the junction of the skin and mucous membrane, and is carried up the bowel so that the pile is left attached by its vessels and mucous membrane only. It is then ligated with strong silk at the neck, and the ligated pile is returned within the sphincters. This plan of procedure is applicable to vascular hemorrhoids and to those in patients suffering from kidney, cardiac, or atheromatous disease. It is, without doubt, the safest operation. The objections to this procedure are that it leaves a wound which is slow to heal, and that there is greater pain after the operation and on the first movement of the bowels than after crushing or simple excision. There is more sloughing and greater liability to contraction.

The crushing operation consists in drawing the pile by means of a hook into a powerful screw crusher. This should be applied to the longitudinal aspect of the bowel and be left *in situ*. This method is applicable when the piles are of medium size and are pedunculated. It is contra-indicated when the ligature is most advisable,—that is, when the pile is large and vascular, or when the patient is distant from medical aid and rapidity of operation is necessary. It is not so safe a procedure as the ligature. The

advantages claimed for it are that there is freedom from pain after the operation, retention of urine is rare, suppuration is unlikely, there is little or no pain during defecation, and recovery is usually rapid.

In using the clamp and cautery the pile is drawn down into the clamp. This portion is cut off, and the stump and vessels are cauterized until the vessel is thoroughly seared. Statistics, however, show that this is a much more fatal operation than ligation or crushing. The burning gives great pain, hemorrhage is more likely to follow, there is extensive sloughing of the rectal tissues, and more time is required to heal, while there is greater contraction.

Probably the most effective method of procedure is that known as the Whitehead operation, which consists in making an incision clear around the anus, through the junction of the skin and mucous membrane, dissecting up the varicose tissue from about the sphincters, removing the hemorrhoidal mass, bringing the mucous membrane down, and suturing it to the skin. In this way all the hemorrhoidal tissue is removed, and the patient is much less likely to suffer from relapse, pain is not great, there is no inconvenience in the evacuation of the bowels, and in severe cases the writer has found that the patients are far more comfortable after the operation than they had been for months previously. In the external hemorrhoid, where a hard blood-clot is formed, the quickest method of procedure and that which affords most prompt relief is to incise and turn out the clot. This results in a cicatrization which cures the hemorrhoid and prevents the formation of external tags or folds of mucous membrane.

In the treatment of hemorrhoids we must not forget the importance of constitutional measures, the relief of the tendency to the development of rheumatism and gout, and the hygienic measures already indicated.

POLYPI.

Benign pedunculated tumors are occasionally found in the rectum. They are usually few in number, and in the adult it is rare to find more than one. Though generally of small size, they sometimes become as large as a prune or even a hen's egg. (Figs. 15, 16.) The size of the growth is dependent upon the blood-supply. The tumor is usually of a rounded form, and is dependent by a slender pedicle. Polypi are commonly situated about an inch to an inch and a half above the anus, rarely higher, though occasionally they are found as high as six inches. Their most common seat is the posterior wall of the gut. The pedicle may be round or flattened ; it is large and short in the fibrous varieties, long and slender in the soft ones. With the repeated passage of fæcal matter over the tumor the pedicle stretches and becomes so elongated that it may tear during defecation.

Such a growth may exist for a long time without causing any suspicion of its presence. The patient may be aware of its existence only when a tumor appears at the anus. It may produce a series of phenomena, as severe pain during defecation, tenesmus, twitching, and a sensation of burning of

the anus radiating through the entire pelvis.   Besides such phenomena, there is a discharge of glairy mucus or blood.   The general health remains good, unless the hemorrhage is so great that anæmia is induced ; in such

FIG. 15.
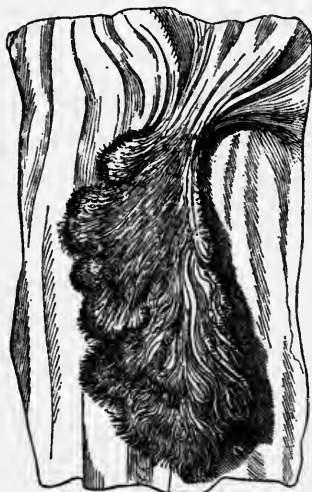
Rectal polypus. (Esmarch).

FIG. 16.

Glandular polypus. (Esmarch).

cases the patient has vertigo and a tendency to syncope.   Polypi may not infrequently be associated with fissures, prolapsus, or even fistulæ.   The progress of the disease is slow in some cases, and may terminate spontaneously by rupture of the pedicle and discharge of the polypus.

The diagnosis is generally easy.   When the tumor protrudes from the anus, inspection is sufficient to reveal its character.   If it is concealed, the introduction of the finger may disclose and bring it down.   From hemorrhoids it is distinguished by the fact that the former are small, turgid projections, disposed like a collar about the anus.   In prolapsus we find, notwithstanding a considerable projection of the mucous membrane, that its centre presents an orifice into which the finger can be introduced, and that no pedicle is present.   Malignant tumors are recognized by the extremely fetid secretion and the grave alteration of the general health.

The treatment consists in the removal of the tumor.   Some operators draw it down and twist its pedicle ; this should be carefully done, so as to avoid prolapsus of the rectum.   The elastic ligature may be used, and a large pedicle should be tied in two sections.   The safest and most expeditious method is to apply a pair of hæmostatic forceps to the base of the pedicle, to draw it down, and to cut away the tumor, leaving the forceps in place.

PROLAPSE OF THE RECTUM.

Prolapse of the rectum is a more or less complete protrusion of the mucous membrane or of all the tunics of the bowel.   The mucous membrane is so loosely connected with the muscular layer by cellular tissue that

it can slide upon the latter and even protrude from the anus. (Fig. 17.)
A slight straining effort, such as accompanies defecation, may be sufficient

FIG. 17.
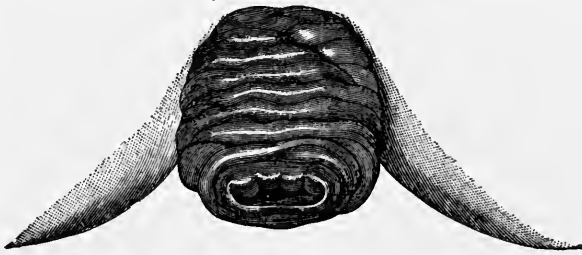
Prolapse of all the coats of the rectum. (Busche.)

to cause such protrusion. This condition can be seen in an exaggerated
state in the horse. Instead of the mucous membrane only, all the layers
sometimes prolapse. (Figs. 18, 19.) A cylindrical tumor from one to three inches in length is then formed. When the tumor is small it has at its inferior extremity a small round orifice, and when large it is often found hollowed out like a horseshoe by the traction of the mesorectum. In the descent the peritoneal cul-de-sac is ordinarily obliterated and a portion of the small intestine may be carried down with it. Notwithstanding the natural predisposition of the tissues to

FIG. 18.
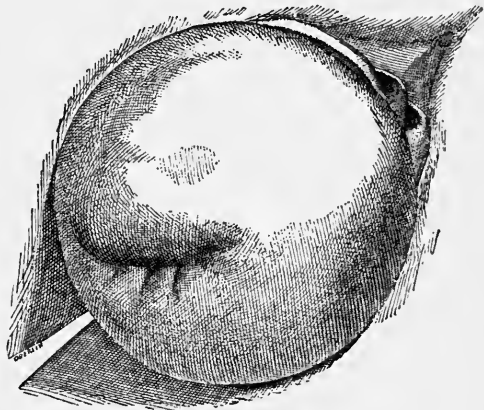
Prolapse of the rectum.

become invaginated, unusual force is necessary to cause extensive prolapse.
The active factors may be diarrhœa or chronic dysentery, the presence of
a polypus or hemorrhoids, repeated pregnancies, tumors of the sacrum, and
the efforts of coughing in cases of chronic bronchitis.

Symptoms.—Simple prolapse appears first as a slight eversion of the
mucous membrane when the patient strains, which disappears more or less
when the effort ceases. The swelling does not subside, but increases in size,
forming a small cylinder an inch and a half to two inches long. The
surface is soft, glistening, folded, and of a rosy hue. In the centre is a
contracted orifice by which the intestine is entered. At the level of the
anus the rectal mucous membrane is continuous with the skin. This
degree of prolapse can be easily reduced by slight pressure. Patients
experience discomfort in walking. The cylinder becomes elongated ; the
mucous membrane changes to a dark color and is painful to the touch.

Subsequently it is covered with pus, or has a grayish hue, showing superficial ulcerations. The membrane assumes the character of the skin, losing its flexibility and sensibility, while its natural furrows gradually disappear. The tumor may attain the size of an orange. It is difficult to reduce it, on account of the hardening and thickening of the submucous tissue, which prevent it from slipping back. In cases of this degree the sphincters dilate, lose their tonicity, and no longer prevent the escape of fæcal matter. Complete prolapse may result in the formation of a very large mass, which may be more or less globular and of a pink or red color. Its external surface still bears the traces of the transverse folds, which indicate the points

FIG. 19.
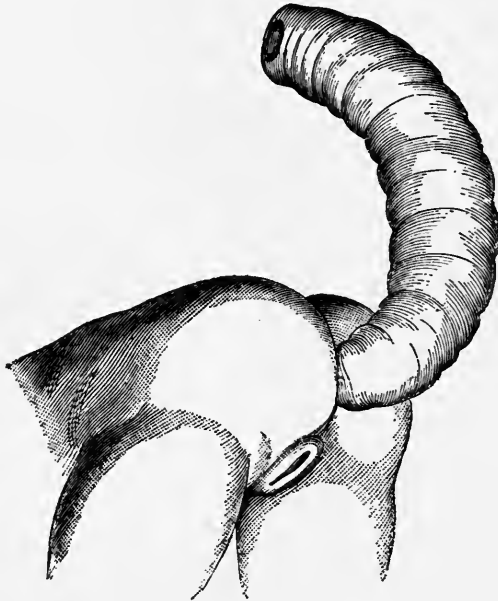
Prolapse of invaginated intestine. (Esmarch).

at which the membrane was in most intimate relation with the muscular tunic. At the most dependent portion of the tumor an orifice will be found communicating with the intestine. The base of the tumor is surrounded by the anus. The prolapsed intestine tumefies and becomes the seat of an acute inflammation which may continue until it sometimes produces repeated hemorrhages that endanger the life of the patient. Peritonitis may be a complication, and finally symptoms develop which indicate strangulation of the intestine. The progress of prolapse is generally slow but continuous, and if the affection is neglected or is badly treated it becomes excessive, and renders not only walking but even the erect position painful.

Diagnosis.—The diagnosis of prolapse is readily determined. In hemorrhoids there are projections more or less independent of one another and

separated by small furrows. Polypi are smooth, pedunculated tumors springing from within the internal orifice of the rectum. Epithelioma cannot be confounded with prolapse, as there are neither the induration, the cauliflower masses, nor the ichorous discharge in the latter which are so characteristic of a malignant neoplasm.

Prognosis.—The prognosis is dependent upon the extent of the affection; the condition is curable according as the prolapsus is reducible or irreducible.

Treatment.—In the treatment of reducible prolapse we return the bowel to its normal position and endeavor to remove the causes which lead to the condition. As a curative means we may employ the thermo-cautery. With the latter instrument three or four lines of tissue are cauterized. The patient is given bismuth or opium to produce constipation, which is overcome on the eighth or ninth day by a light purgative. In irreducible prolapse a number of methods have been advocated, some of which are purely palliative, while others are supposed to restore the muscular tone of the vessels forming the pelvic floor and serving to support the rectum. Nux vomica, strychnine, and finally hypodermic injections of ergotine have been administered with this purpose. Dupuytren produces a cicatricial narrowing of the anus by removing with curved scissors from two to six radiating folds to the right and left of the anus. Duret removed from the posterior wall of the rectum a triangular piece of the mucous membrane, the base of which included a part of the sphincter. Schwartz excises a large piece of the anterior wall of the anus and rectum. Mikulicz shortens the rectum in the following manner. The intestine is emptied by an injection, and opium is administered to limit peristalsis. The patient is placed in the dorsal position, and the field of operation is rendered aseptic. At a point from two-fifths to four-fifths of an inch from the anus the external cylinder is divided in its anterior half. The next step consists in incising transversely the posterior half of the external cylinder, layer by layer, from three-eighths to six-eighths of an inch from the margin of the anus. Sometimes upon reaching the peritoneum a hernia of the small intestine will be perceived, and will need to be reduced. Should the sphincter prevent reduction, the muscle may be cut and the peritoneal folds united. The bowel is then incised, layer by layer, the vessels met with being tied, and the two edges are reunited by interrupted sutures carried through all the coats, threads being left long enough to serve to steady the rectum during the remainder of the operation. The dissection and suturing of the posterior half are next performed, all the sutures are cut short, and the mass is powdered with iodoform and reduced.

An operative procedure called "rectopexy" was introduced by Verneuil. It consists of three steps, as follows. An incision is made about an inch and a half long upon each side of the anus, extending obliquely from above downward and backward. The portion of the anal circumference included

between the anterior extremities of these incisions corresponds to the portion to be contracted; they begin at the point of junction of the skin and the mucous membrane. From their posterior extremities start two other small incisions, which meet at the coccyx. The included flap is dissected from behind forward, the posterior fourth of the sphincter being removed at the same time, care being taken not to injure the rectal wall. The second step consists in the insertion of four sutures of silkworm-gut, introduced transversely with a curved needle into the posterior wall of the rectum, without injuring the mucous membrane. When the sutures are drawn towards the sacrum, it will be seen that the cavity of the rectum is made decidedly narrower and that the posterior wall is fixed to a certain extent. To make this result permanent, a needle is introduced through the skin near the sacro-coccygeal articulation, about an inch from the median line, and is brought out in the ano-coccygeal wound. The corresponding end of the upper suture is then passed through the needle's eye and is drawn out by withdrawing the needle, which is then introduced at a corresponding point at the opposite side, and the other end is secured. The other sutures are treated in the same way, being tightly drawn and tied one after the other. The third step consists in excision of the cutaneous flap which has been dissected and is adherent by its base. A few sutures are inserted in the vicinity of, and a little higher than, the anus. This operation affects only a limited portion of the rectum either in length or in height.

Roberts's Operation.—Roberts recommends the following plan of procedure. The patient is placed in the lithotomy position, and the protruded rectum is reduced. An incision is made in the median line of the perineum, near the coccyx, large enough to admit the point of the finger, and the cellular connections posterior to the rectum are separated. By introducing the knife into the anus a triangular portion of the tissue, consisting of skin, cellular tissue, and an inch of the sphincter muscle, is incised; the base of the triangle is at the margin of the anus. With scissors a long triangular section is cut out of the posterior wall of the rectum, the apex of which is about three inches up the gut, while its base corresponds with the inch of excised

FIG. 20.
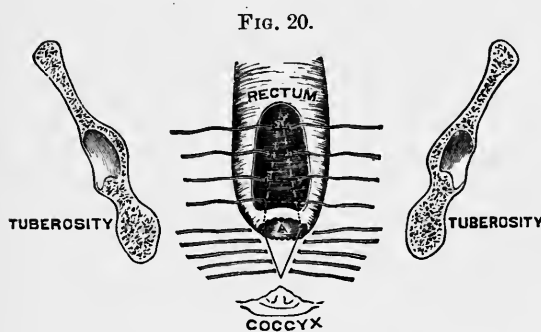
Roberts's operation for prolapse.

sphincter previously described. (Fig. 20.) Hemorrhage is controlled with catgut ligatures, and the rectal wound is closed with chromicized catgut sutures, which are all tied from the rectal side. The operation renders the lower end of the bowel funnel-shaped, with the small end of the funnel towards the anus.

STRICTURE OF THE RECTUM.

Stricture of the rectum is a narrowing or stenosis of the canal, which may result from a variety of conditions. One of the most important is cancer, but this form of stricture we shall consider under that heading. The pathology of non-malignant stricture of the rectum is somewhat obscure. While some assert that it is due to syphilis only, there is no question whatever that chronic diarrhœa and dysentery may give rise to inflammation and ulceration of the mucous membrane, which subsequently results in thickening of the submucous tissue and stenosis of the canal. Tuberculous disease is also a not infrequent cause. With tuberculous ulceration there is a tendency after a time to healing of the ulcerated surface, which results in contraction. This may continue until a large extent of the intestine is involved and the stenosis is very marked. The tissue contracts, the bowel above becomes dilated, ulceration takes place around the margin of the stricture, and this subsequently contracts, thus giving increased length to the stricture. In addition to the causes mentioned, stricture may result from the introduction of irritating substances, the presence of foreign bodies, and syphilis. Syphilitic stricture is usually annular in form, is situated at the lower part of the canal, and is quite firm.

Symptoms.—The patient complains of distress and great difficulty in evacuating the bowels; she cannot defecate unless the contents are in a fluid condition. She has a sensation of weight and pressure in the pelvis. Fæcal movements, when formed, are thin and ribbon-shaped, and are expelled with marked difficulty; later only fluid can pass the bowel. Strictures are readily recognized by the rectal touch. Situated, as they usually are, at the lowest part of the bowel, they are generally within reach, and there is no difficulty in arriving at an accurate knowledge of the condition.

Treatment.—It has long been the rule to treat rectal strictures by divulsion with large bougies. The objection to this, however, is that the use of these instruments only aggravates the stricture by causing an increase of the cicatricial tissue. The bougies must be frequently used, or the patient will suffer a return of the trouble. In an annular stricture the better plan of procedure would seem to be either to incise it posteriorly and then to sew the divided edges together from above downward, which would considerably increase the calibre of the gut, or to cut out a ring involving the diseased tissue and to suture the divided ends of the gut. The entire ring may be excised and the ends of the gut brought in apposition by sutures. The only objection to this procedure is the difficulty with which it is accomplished from within the rectum. If the stricture becomes very tight, and the patient suffers marked inconvenience, we must consider the advisability of forming an artificial anus. It seems to the writer preferable in all such cases to precede the operation by sacral resection, and, after removing the diseased tissue, to make the artificial anus at the end of the resected bone. The advantages that may be claimed for this procedure over inguinal or

lumbar colotomy are—1, the patient is enabled to have an evacuation of the bowels without being obliged to assume an unnatural position, and with much less disarrangement of her apparel; 2, she is better able to protect her clothing and person from being soiled with fæcal matter; 3, the situation of the artificial anus near the bone renders it much less likely to undergo cicatricial contraction than when it is situated in the loin.   When there is a suspicion of syphilis, the local should be supplemented by anti-syphilitic treatment.

CANCER OF THE RECTUM.

The usual seat of cancer is at the inferior extremity of the rectum, unless it is secondary to cancer of the uterus, when it is situated higher up. Cancer of the rectum varies greatly in appearance.   It may occupy the lateral wall, having an annular form, or it may appear as small disseminated nodules.   The recto-vaginal septum is often invaded.   When the disease is far advanced it may result in the formation of a recto-vaginal fistula. The exuberant variety has a cauliflower appearance, a soft consistence, and bleeds at the slightest touch.   When a great number of these vegetations unite they form actual tumors.   The ulcerative form is often met with, especially when the cancer occupies the anal region.   The ulcer rests upon an infiltrated base sharply circumscribed.   It is not unusual to find at its edges outgrowths similar to those which have been mentioned.   As it progresses, rectal cancer results in constriction of the gut, which may be complete.   The resulting complications are similar to those referred to in the description of simple stricture; there may be abscesses or fistulæ even more frequently than in the purely cicatricial form.

Symptoms.—The onset of cancer is insidious, but it is easily recognized by the general condition of the patient, which is visibly affected.   Obscure digestive troubles develop, and repugnance to certain foods, especially meat. The patient complains of constipation, alternating with diarrhœa, and the stools often present the appearance of soot or coffee-grounds.   If we do not examine the rectum, we may suspect cancer of the stomach, but later phenomena appear which draw the attention of the patient to the site of the trouble.   She has a sensation of weight, burning pain, and tenesmus; defecation becomes painful, and is accompanied with more or less loss of blood and mucus.   As the neoplasm extends, the symptoms enumerated in the description of stricture are present.   Stercoræmia may exist, to which is added the absorption of septic products, due to breaking down of the growth.   Intestinal obstruction seems imminent, and there is a constant burning pain which radiates through the pelvis, so that the patient finds it impossible to sit or lie, and her existence is rendered miserable.

Diagnosis.—The diagnosis of rectal cancer presents but few difficulties. The finger recognizes the annular disposition of the growth, the cauliflower vegetations, induration, and other phenomena indicating the character of the disease.   On withdrawal, the finger will be found to be covered with

blood and epithelial débris, and the examiner will be aware of the extremely fetid odor of the discharge. It is important to note the form, extent, and variety of cancer, and at the same time to make a complete examination of the vulva, vagina, cervix uteri, and cul-de-sac of Douglas. In making a differential diagnosis, it is always well to bear in mind the different tumors which develop at the level of the rectum or in its vicinity. Polypi are smooth and pedunculated, and are implanted upon the unaltered mucous surface. A cicatricial stricture is regular, more circumscribed, and never presents the extensive induration and large vegetations so frequent in epithelioma. In some cases it is difficult to distinguish scirrhous from fibrous strictures, and it is only from the progress of the case that one can decide the diagnosis. Hemorrhoids cannot be readily confounded with epithelioma; they are small capillary tumors, smooth, rounded, circumscribed, and even when they are the seat of ulceration, the ulcerations are small.

Prognosis.—The prognosis is always extremely grave, and the relief, even after the most radical treatment, is generally only temporary.

Treatment.—The treatment varies according to the indications. If the disease is rapid, the general state bad, and there are signs of metastasis, it

FIG. 22.

FIG. 21.
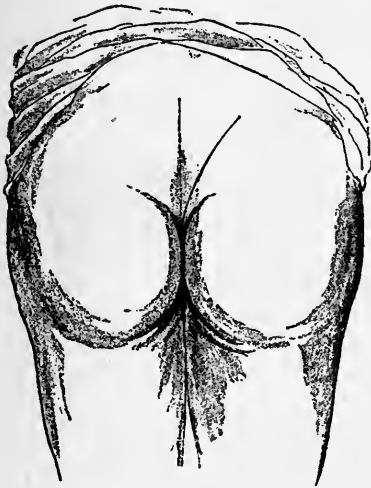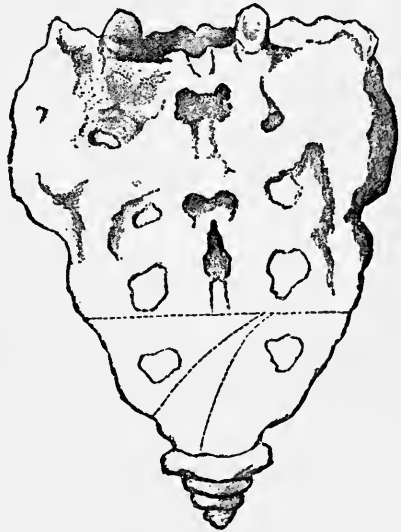
is better to avoid operation. All that we can do is to relieve the pain with suppositories or injections of morphine, and to overcome constipation with laxatives. The diet should be carefully regulated, being confined to such food as furnishes the largest amount of nourishment with the least amount of solid residue. The palliative procedure, dilatation by bougies, should be rejected. Proctotomy consists in making a posterior median section comprising all the soft parts from the anus to the coccyx. This operation is done for the purpose of facilitating the evacuation of the bowels and saving

the patient from obstruction.   The indications for it, however, are excep-
tional.   The creation of an artificial anus is the most effective method of
treating the obstruction in some cases.   This should be made in the left iliac
region in those cases in which the disease involves the greater part of the rec-
tum.   When it is limited to the anus or the lower five inches of the rectum,
extirpation should be performed.   This is best done by the sacral method.
The patient is placed upon her left side, and a crescentic incision is made
over the sacrum (Fig. 21), beginning at the right side of the sacro-iliac syn-
chondrosis, the knife being carried across the median line to the left side,
ending to the left of the anus; the skin and superficial fascia are drawn aside
and the coccyx and sacrum are exposed; the muscular attachments are dis-
sected from the sacrum and the coccyx is removed.   Then, with bone forceps
or with a chain saw, two lower segments of the sacrum are exsected, the pre-
caution being taken not to extend the resection above the third sacral fora-
men.   (Fig. 22.)   Bleeding is arrested, and the rectum is then drawn aside
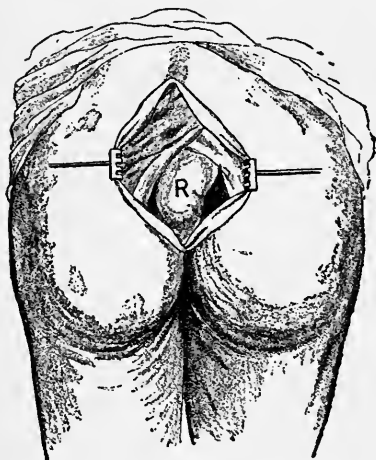
FIG. 23.   FIG. 24.
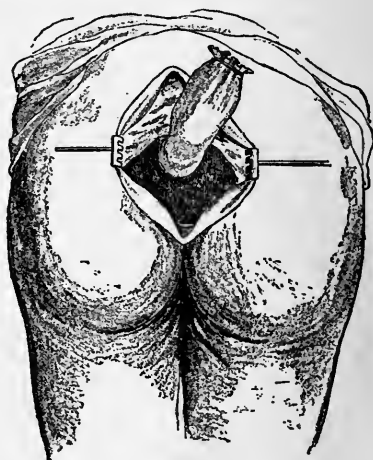
and is dissected completely away.   (Fig. 23.)   If the vagina is already in-
volved, a portion of the vaginal wall may be removed with the rectum.   The
entire gut should be encircled, separated, drawn down, and, if the disease
has extended high up, the gut may be removed within the peritoneal cavity.
(Fig. 24.)   This is performed by opening the peritoneum, detaching its
reflection from the bowel, drawing the latter well down so as to cut beyond
the disease, and stitching the parietal to the visceral peritoneum : we then
proceed to amputate the diseased tissue.   In this way we make sure that
the peritoneal cavity will not be infected by the escape of fæcal matter.
The edges of the divided intestine are then sutured to the skin over the
sacrum, so that a new anus is formed just beneath this bone.   The writer
has performed five sacral resections, with one death.   In the last case in
which it was necessary to perform this operation—in a young woman

Fig. 25.

Sacral resection, with removal of a portion of the rectum, the uterus and appendages. and the posterior wall of the vagina and the perineum.—*A*, artificial anus; *B*, anterior wall of vagina ; *C*, vulva.

twenty-three years of age—the disease had already involved the vagina and the margin of the perineum, and extended upward along the vagina as high as the cervix uteri. Inguinal colotomy had been done some four months previously. The sacrum was resected; five inches of the bowel, the whole of the posterior wall of the vagina, the perineum, the uterus, ovaries, and tubes, were removed; the intestine was sutured to the anterior wall of the vagina and posteriorly to the skin over the sacrum; the skin of the buttocks was sutured to the edge of the anterior wall of the vagina. After the patient had recovered, the opening in the colon was closed, so that all evacuations now take place through the opening in the bowel at the upper part of the vagina. Fig. 25 shows the extent of the wound.

CHAPTER XVIII.

DISEASES OF THE FEMALE BREAST.

BY DUDLEY P. ALLEN, M.D.

THE female breast varies largely in its anatomical, histological, and physiological condition, according to the time of life and the functions which it performs.

Before puberty the breast of the girl differs very little from that of the boy. With the advent of puberty the former enlarges and becomes more prominent. Often from the age of twenty-five to thirty there is a decrease in the size of the female breast, due to a decrease in adipose tissue consequent to a corresponding decrease in the weight of the person, which is not infrequent at that age. During pregnancy and lactation the breast increases largely in size, but after the cessation of lactation it decreases, becoming smaller and more relaxed, as a rule, than before pregnancy. After the menopause the breast atrophies, and is much relaxed. Occasionally the decrease accompanying the cessation of lactation and the menopause may be compensated for by the increase of adipose tissue, so that the contour of the breast is preserved.

In the new-born, according to Orth,[1] there are from ten to fifteen milk-ducts, ending in club-shaped enlargements, and lined with cylindrical epithelium. With puberty multiple buds or diverticuli appear, and the gland takes on an acinous character. These gland-formations push themselves outward into the surrounding fat, being enveloped by hyaline connective tissue.

During pregnancy new acini are developed, each containing a distinct lumen. The membrana propria surrounds the acini and connecting ducts, and is formed of flattened cells. Around this is a connective tissue rich in vessels. In pregnancy the acini increase in number and size and are crowded closely together; they terminate in twelve to fifteen ducts with spindle-shaped enlargements, and end in the nipple, which is surrounded by unstriped muscular fibre. With the end of secretion the glandular elements decrease, though they do not disappear, but the connective tissue increases. After the menopause the glandular portions decrease, the acini disappear, but the ducts remain, being similar to those in the new-born.

---

[1] Lehrb. der Speciel. Path. Anat., 1893.

These ducts may become dilated and pour out a green or brown secretion.

According to Sappey, the breast is very rich in lymph-vessels. They surround the acini and milk-ducts, converging towards the centre of the gland. About the areola there is an abundant convolution of lymph-vessels, and these together enter several large lymph-channels which converge towards the axilla.

Heidenhain suggests that this concentric arrangement of the lymph-vessels may account for the fact that the location of a tumor does not seem to influence the time at which the axillary glands become enlarged. Orth says that the deep lymph-vessels go to the fascia of the pectoralis major and spread themselves out upon it, terminating in the axillary glands, and a small portion of them penetrate the chest-wall near the sternum. Heidenhain says, "So far as I can see, the lymph-vessels of the pectoralis fascia are not connected with those of the muscle itself." Ludwig and Schweigger-Seidel say that the injection of the lymph-channels is easy in the direction away from muscles and tendons, but difficult towards them.

Heidenhain says that, though infection of the muscle is hard to trace, it must come, when it does occur, through the lymph-channels, and he cites one case in which he found an infected lymph-gland close to the sternum, and a second in which he found a gland infected with carcinoma lying upon the pectoralis major.

The breast receives its blood-supply chiefly from the internal mammary and long thoracic arteries. Some branches may come from the intercostal artery.

The nerve-supply is principally from the intercostal nerves, between the fourth and the sixth.

The physiological function of the female breast is the secretion of milk. This may be carried on normally, beginning with the secretion of colostrum sometimes a little before, and at any rate shortly following, parturition. It is followed by the secretion of milk, which continues for a varying length of time. Owing, doubtless, to changes resulting largely from civilization, the amount of milk secreted varies widely in different cases.

ANOMALIES OF THE BREAST.

Anomalies of the breast may be of different sorts, resulting from retarded development or from increased development. There are also anomalies of function. According to Leichtenstern, increase in the number of nipples, with or without a corresponding increase in the number of breasts, occurs with about equal frequency in both sexes, probably, however, a little oftener among men than among women. In ninety-one per cent. of all cases this increase is upon the anterior wall of the thorax. Cases occurring in the axilla, on the back, over the acromion, and on the thigh, are rare. In ninety-four per cent. of all cases they occur below the normal breast, and usually towards the median line. He observed thirty-four accessory

nipples on the left and sixteen on the right side. There was no evidence of heredity. The accessory breast may secrete milk. Orth says that the development of accessory breasts or nipples brings out the question of atavism.

Delbet[1] cites a case in which there were four breasts, from all of which the patient could nurse equally well.

Bland Sutton, as does Orth, suggests that supernumerary breasts and nipples on the anterior part of the thorax correspond to analogous conditions in the lower animals, their location depending on the fact that they receive their blood-supply from the internal mammary and epigastric arteries.

Blanchard and Delbet suggest that all those occurring away from the line of the epigastric and mammary arteries should be regarded as anomalies, produced by the epiblast. Martin[2] says that the irregular location of supernumerary nipples is due to the fact that the milk-line is located in the embryo upon the back, and as it is gradually pushed forward upon the sides and front, irregularities in the arrangement of the nipples may occur, and he thus accounts for their presence on the thigh and over the acromion.

Microthelia.—Microthelia is a term applied to conditions in which the nipple is small or sunken. In the case of sunken nipples Kehrer has suggested that an elliptical piece may be removed from the integument above and below the nipple, and that by drawing together the openings thus made in the integument the nipple will be lifted up and made sufficiently prominent.

The nipple may, however, become invaginated, turning inward like the finger of a glove, so that no operation can benefit it.

Athelia.—Athelia, or absence of the nipple, according to Williams,[3] is more common than absence of the breast. The breast may be normal in other respects. Microthelia and athelia (Birkett) are common sources of inflammation. In ninety-seven cases of acute mammary abscess Birkett found imperfect development in forty-eight. According to the same author, absence of the nipple is not infrequently ascribable to traumatism occurring in the newly-born.

Polythelia.—In polythelia the supernumerary nipples follow a line from the normal nipple downward and inward, or upward and outward. This, according to Wiedersheim, would correspond to the milk-line to be discovered in the embryo of pigs.

Bruce[4] among 207 men found 9.11 per cent. of supernumerary nipples; among 104 women, 4.8 per cent. Ammon[5] among 2189 men found either

---

[1] Duplay et Reclus, vol. vi.

[2] Archiv f. Klin. Chirurg., Band xlv. Heft 4, p. 883.

[3] Journal of Anatomy and Physiology, London, 1890 and 1891, p. 304.

[4] Ibid., 1879, p. 425.

[5] Wiedersheim, Bau des Menschen, 1893, p. 17.

distinct nipples or indications of them in 114 cases, or in one out of every nineteen. Bardeleben[1] found among 2430 men 76 cases of multiple nipples on the left side, 44 on the right side, and 31 on both sides,—in all 151 cases, or 6.21 per cent. All supernumerary nipples were below the normal breast. In six or eight cases there were from three to four nipples on one side.

FIG. 1.

Polythelia, showing ten nipples. (F. L. Neugebauer, Warsaw.)

Micromazia.—Micromazia, or small breast, is a more frequent defect than absence of the breast. Williams says it may affect one or both breasts, and may or may not be accompanied by malformation of the chest-wall, muscles, or genital organs. According to Orth, it is more common on the right than on the left side.

Delbet (op. cit.) says that breasts may remain seemingly normal until puberty, and then fail to develop on one or on both sides. Puech is cited by Delbet as suggesting that small breasts may be associated with an infantile uterus. Cases of this sort are recorded by Virchow, Négreer, and Rokitansky.

Amazia.—Delbet says that absence of one breast is extremely rare, and has been observed only in women. It is accompanied at times by

---

[1] Bardeleben, Verhandl. Anat. Gesell., München, 1891, p. 249.

deficiencies of the corresponding arm and pectoral muscles, and in one case there was absence of the corresponding ovary. Williams (*op. cit.*) affirms that amazia is one of the rarest of deformities, and, although commonly accompanied by other defects, may occur in subjects otherwise entirely normal. Orth (*op. cit.*) says that amazia of both sides occurs only in monsters. When single, it is more common on the right than on the left side. Delbet says that amazia on both sides occurs only in monsters, and usually in those having other deformities which render them incapable of existence.

Polymazia.—Polymazia, or multiple breasts, is of more frequent occurrence than some of the other anomalies. They may vary from small

Fig. 2.

Polymazia. Accessory nipples on each breast, and accessory breasts at border of each axilla. (Illustration from Dr. T. Kuroiwa, of Tokyo, Japan.)

nodules to breasts sufficiently developed to suckle infants. Hansemann collected two hundred and sixty-two cases; of these, eighty-one were men, one hundred and four were women, and in seventy-seven cases the sex was not given. Delbet (*op. cit.*) cites Leichtenstern as having found among seventy-two women with multiple breasts only three who bore twins.

Among the interesting cases of polymazia were those of the mother of the Emperor Severus, who was named Julia Mammæ on this account, and Anne Boleyn. A very perfect instance of this condition is cited by Kuroiwa in a medical journal published in Tokyo. The case presented, in addition to the normal breasts, two nipples four centimetres above each breast. On

Fig. 3.

Hypertrophy of the breasts.

the border of each axilla were two small mammary glands with well-formed nipples.

Baraban[1] says that enlargements found on the border of the pectoralis major, as distinguished from those within the axilla, when connected with tumors of the breast, should arouse the suspicion of their being secondary portions of the mammary gland rather than infected lymphatic glands. In connection with lactation the accessory glands may become enlarged, and, as has been said, secrete milk in considerable quantities, although this is by no means universal. An aid to their diagnosis is the fact that in connection with lactation and sometimes with menstruation these accessory nodules become enlarged, as does the normal breast, and at times painful. The importance of recognizing them is that they may be distinguished from what might otherwise be taken to be malignant growths.

Martin holds that portions of breast-tissue in the axilla, without excretory ducts, should be looked upon not as accessory breasts, but as portions of the breast which have become detached in the process of development. He differs from Williams and Bardeleben in holding that these are rarely the seats of malignant growths.

Hypertrophy.—Hypertrophy of the breast is a comparatively rare condition. It is usually described as occurring at two periods : first, at the age of puberty ; second, in connection with pregnancy. A considerable number of cases are reported as occurring at both these periods. Crawford cites a case of acute hypertrophy in both mammæ in a girl of the age of fifteen. Both were amputated, the second at an interval of sixteen days after the first, the first weighing thirteen pounds and the second weighing eleven and one-half pounds. Delbet (*op. cit.*) has collected twenty-seven cases of hypertrophy of the breast, of which twenty-five appeared before the age of twenty and eleven between the ages of fourteen and fifteen. He considers hypertrophy the result of a simple increase of physiological processes.

Porter[2] reports an interesting case of hypertrophy of both breasts in a woman thirty-seven years of age, whose history is somewhat peculiar, inasmuch as the woman had borne two children, the youngest being ten years old. Three years previous to her entrance to the hospital she had noticed a hard lump in the right breast, which had gradually increased in size and with it the whole breast. Three months later the left breast became similarly affected. At the end of six months the right breast was the size of a baby's head and the left a little smaller. From this time on the growth was gradual until three months before entering the hospital, when the growth became very rapid. Both breasts were removed, with an interval of three weeks between the operations. The weight of the tumors was not given, but they were very large.

---

[1] Revue Médicale de l'Est, 1890, p. 252.

[2] Transactions of the American Surgical Association, 1891.

According to Delbet, in cases occurring at puberty the growth is usually so rapid that in from two to three months the volume becomes considerable. Sometimes it is slower, requiring from one to two years. Of the cases occurring at puberty, Monteils reports one as resulting in recovery.

Orth says that diffused hypertrophy usually begins with the first menstruation, and that the breasts grow rapidly during two to four months. Growth then ceases. He says they are apt to increase again at pregnancy. This is due to the development of the gland structures, since hypertrophied breasts—as, in fact, all maiden breasts—are largely made up of connective tissue. The differential diagnosis between hypertrophy and adenoma may be difficult. Symmetrical enlargement would indicate hypertrophy, while irregular enlargement would indicate adenoma. Histologically, the fact of the acini being lined with cylindrical epithelium would indicate them to be adenoma.

Billroth[1] says that diffuse hypertrophy usually begins with puberty. The breasts grow rapidly for a time, and then growth ceases. They may increase again during pregnancy, but they do not grow to an unlimited degree. As they enlarge, the skin covering them becomes stretched, the nipple flattened, and the patient greatly burdened by the weight.

Delbet says that hypertrophy is the result of augmentation of the gland-tissue, and not of the fat or fibrous tissue. The condition of the gland varies in size according to whether it is observed during pregnancy, lactation, or at some other period. Hypertrophy does not prevent secretion of milk. Billroth (op. cit.) cites a case of abortion at the fifth month, the hypertrophied breasts being engorged with milk. Lotzbeck mentions a case of hypertrophy of one breast where there was enormous secretion of milk in the second pregnancy. The case had become hypertrophied at the time of puberty. Delbet says that during gestation and lactation the glandular tissues predominate; at other times, fibrous tissue is most abundant. Various modifications may occur, however, in hypertrophied breasts. Large numbers of fibrous nodules may occur, and cysts may be present. The former may give the aspect of a uterus filled with fibromata, or the latter may break open and suppurate. The prognosis of hypertrophy at the time of puberty is grave, since it weighs down the patient and requires amputation. If this is not performed the patient may become feeble and emaciated and die of intercurrent affections, suppuration, or even gangrene. Billroth (op. cit.) says of diffused hypertrophy that the patient is usually worn down by the growth, though she may live a long time. He cites a case of Gräh's where the patient lived eighteen years. Death usually comes from ulceration and intercurrent affections. Treatment by compression and iodide of potassium is of slight value. Amputation is the only cure.

Tarnier and Boudin say that in cases of hypertrophy confinement is

---

[1] Billroth, Deutsch. Chirurg., p. 74.

usually premature or the offspring is small and feeble. Thus it would seem that in the hypertrophy which occurs at puberty the growth is rapid, that recoveries are few,—the tendency of the disease being to wear out the patient,—and that amputation is the only rational treatment. In the hypertrophy of pregnancy the prognosis is much better, since in a considerable proportion of cases the breast again decreases markedly in size. In a case of hypertrophy accompanying pregnancy, affecting one breast, which came under my own observation, within a few months after confinement the breast decreased largely in size, although it did not become reduced entirely to the size of the other breast.

In the hypertrophy of pregnancy the large breast should be supported by a bandage, in the hope that it may later decrease in size. In the hypertrophy of puberty amputation is the only treatment that is of benefit. Hey cites a case of hypertrophy of both breasts, in which, after the amputation of one, the other diminished in size. Usually, however, both breasts must be amputated.

Agalactia.—The complete absence of milk after parturition is of rare occurrence. Often, however, the quantity secreted is very little. This seemingly is the result of artificial habits of living accompanying civilization; its occurrence has not been correspondingly observed among primitive races.

A rare case of agalactia is reported by Harlan, of a woman who bore thirteen children without secreting any milk. Her mother bore twenty-five children without secreting any milk.

Galactorrhœa.—Galactorrhœa may occur, and cases have been reported where as much as seven litres has been secreted per day. An abundant flow of milk may continue a long time, even for several years. In rare instances milk is found to have been secreted before puberty, and a case is recorded of a little girl in whom the secretion of milk was stimulated by the placing of a baby to her breast. Billroth cites the case of a girl of eight years who thus secreted milk, and also one of a woman fifty-nine years of age who had not borne a child for seventeen years. He says he had never himself seen a case. In connection with this it may be of interest to mention the case of a woman who told me that with each pregnancy she was able to collect in her mouth, by suction, presumably from her parotid glands, a fluid which resembled milk, and that her sister had the same ability. Unfortunately, I had no opportunity of examining the material secreted.

ECZEMA.[1]

Eczema is of frequent occurrence in the breast. Although it may attack any part, it is most common beneath large and pendulous breasts which hang down and lie upon the chest-wall, and thus, by the retention of secretions and collection of moisture, create irritation of the skin. Its

---

[1] *Vide* chapter on Cutaneous Diseases.

treatment is similar to that of eczema elsewhere, and it is especially important that the surfaces should be kept apart and the irritation thus prevented.

MOLLUSCUM.

Pendulous tumors may arise from the areola surrounding the nipple, but are of slight importance. There may also be irritation in and suppuration of the glands of Montgomery surrounding the nipple.

SEBACEOUS CYSTS.

Sebaceous cysts may occur in the breasts. Cahen cites a case of atheroma having its seat over the sternum. Porta says that of three hundred and eighty-four sebaceous tumors three were found in the deep cellular tissue of the gland of the breast. In a case operated on by my assistant, Dr. Nevison, a small sebaceous tumor was found forcing its way down into the tissue of the gland. The tumors are similar to those found elsewhere.

DERMOID CYSTS.

Dermoid cysts are very rare. Hermann reports a case of dermoid cyst filled with sebaceous material, discovered post mortem, with a distinct cyst-wall which was easily separated from the surrounding tissue. Klebs[1] says that dermoid cysts containing butter-like masses occur rarely in the neighborhood of the breasts. He cites Gussenbauer as saying that several dermoid cysts which he observed in the mammæ were subcutaneous, and, as they enlarged, had pushed their way into the gland rather than developed in the gland itself. The treatment of dermoid cysts in the breast is by enucleation.

INJURIES OF THE BREAST.

Contusions of the breast follow much the same course as those occurring elsewhere, though in the case of nervous women they may be the seat of much pain subsequently. At times they are followed by ecchymoses which have been supposed to develop into fibroma. Their treatment consists in compressing the breast and sustaining it by a bandage. Contusions may also give rise to mastitis, and when occurring at birth may produce mastitis neonatorum. They rarely give rise to abscess.

Delbet says of wounds of the breast that they are peculiar only during lactation, at which time it may be necessary to stop nursing in order to heal them. Burns attacking the nipple are serious, since they may so damage the milk-ducts as to destroy them. Wounds may produce serious inflammation as a result of the laying open of the complicated structure of the gland-tissue, a tissue which is not favorable to healing.

Spontaneous ecchymoses may occur, and when they do it is usually at the menstrual period. This hemorrhage is generally subcutaneous, but

---

[1] Klebs, Handbuch der Path. Anat., vol. i. p. 99.

rarely is interstitial, and still more rarely may extend into the lumen of the glandular tissue. It may be vicarious in dysmenorrhœa and amenorrhœa. The hemorrhage is, however, usually absorbed. Rokitansky has suggested that these hemorrhages, which may also result from trauma, may be the origin of connective-tissue tumors.

NEURALGIA AND NEUROMATA.

Billroth (*op. cit.*) says of neuralgia that—first, it may be connected with tumors and be cured by their removal; secondly, it may be a pure neuralgia without tumors, and not benefited by operation; thirdly, it may have its origin in intercostal neuralgia.

Neuralgia may occur with or without tumors, but it usually occurs with tumors that are benign. It may occur in connection with a series of nodules, only one of which is the seat of pain. It may be accompanied by congestion of the breast; but some cases show no appreciable alteration. The pain in these cases may be extreme. When several nodules are present, an excision of a portion of the nodules is of no service, since pain usually follows in others. Compression in connection with soothing applications is of value. Electricity has been suggested as a means of treatment.

Neuromata are said to be almost universally fibromata. Fowler[1] cites seven cases of tumor of the breast occurring in neurotic women, associated with tenderness and irritability of the uterus and ovaries. Massage of the uterus in a portion of the cases, and marriage in others, caused complete disappearance of the tumors. The tumors had the appearance of malignancy, and removal had previously been advised.

Orth says that there may occur in the breasts of hysterical women enlargements varying from a small size to that of an egg, and appearing in all respects like tumors, while they are simply the result of hyperæmia and œdema of nervous origin. A case has recently come under my own observation of a woman, aged forty, with a tumor which reappears from time to time, being painful when present. So far as the patient can observe, it is influenced chiefly by the weather, returning and being painful in stormy weather and disappearing when the weather again becomes clear.

HYDATIDS OF THE BREAST.

Echinococci are said by Orth (*op. cit.*) to be rare, and cysticerci rarer still. Boecher says that among four thousand seven hundred and seventy cases treated during ten years in the Charité, Berlin, there were thirty-three cases of echinococci. Of these, fourteen were among women. None of them, however, occurred in the breast. Von Bergmann cites one hundred and two cases of echinococci of the surface of the body, fifteen of which occurred in the breast. Birkett, Henry, Le Dentu, and Von Bergmann report cases varying in size from that of a hen's egg to that of a fist. Bill-

---

[1] New York Medical Record, February 15, 1890, p. 179.

roth says there is usually only one mother-cyst, daughter-cysts being rare. They are, as a rule, sterile, and the hooklets are often absent. They appear like other cysts, are painless, and do not have fremitus, which can often be felt in cysts located elsewhere. They are characterized by the fact that the fluid contains no albumen, unless it be the result of inflammation occurring after the death of the parasite. Billroth advises extirpation.

Dubreuil reports a case of a woman, forty-four years of age, who had a tumor in the upper part of the breast during two years, which was at first movable and painless. Becoming painful and increasing in size, it was removed and found to be a suppurating hydatid cyst. Hydatids, as a rule, are at first small, being of the size of a hickory-nut. They increase slowly to the size of an egg or a small apple, the growth requiring one or perhaps several years. They are usually hard, non-fluctuating, and commonly free from pain. It is difficult to distinguish them from other cysts, and this can be done only by puncture. Dubreuil recommends in place of ablation a wedge-shaped excision of the portion of the breast containing the cyst.

MASTITIS.

Inflammatory processes in the breast may be superficial, attacking the nipple and the areola with the integument, or may involve the gland itself, or may be situated behind the gland, lifting the gland from the thoracic wall. Mastitis may also occur, involving the entire tissues of the breast.

Inflammation of the skin has already been spoken of under the head of eczema, as well as abscesses of the glands of Montgomery. Erysipelas and phlegmonous abscesses may occur, resulting in antemammary abscesses. Retromammary abscesses are more common from caries of the rib or pleurisy, and may lift the breast so that it floats upon the thoracic wall. In one of my own cases in which the pleural cavity was full of pus, perforation took place between the third and fourth ribs underneath the left breast, lifting it entirely from the wall of the thorax.

Billroth (*op. cit.*) says that mastitis may occur in new-born children, at puberty, and during pregnancy, but that all these conditions are rare. Delbet says of the mastitis of puberty that it is usually slight and disappears of itself. Mastitis in general is most common in primiparæ, blondes, and lymphatic subjects. Delbet remarks that mastitis is much more common among primiparæ than among multiparæ, and is rare after the fourth pregnancy. Koehler found evidences of inflammation in 55.87 per cent. and Deiss in 50.84 per cent. of cases examined among primiparæ. These statistics refer chiefly to cracks and fissures. The cessation of lactation seems to increase the frequency of mastitis; but it is to be remembered that this cessation may be the result rather than the cause of inflammation. Koehler, already cited, considered the first two weeks as the most common time for mastitis, whereas Bryant, Bumm, and Winckel state that it is most common in the third and fourth weeks. Statistics differ as to whether it is the right or the left breast which is the more frequently attacked.

Delbet cites one hundred and fifty cases of mastitis collected by Martin, all but eight or ten of which occurred during lactation ; of fifty by Winckel, all but one occurred during lactation. Koehler, in his Thèse de Bâle, arrived at about the same result. Deiss, in 1889, reports sixteen hundred confinements from the Heidelberg clinic, with 3.6 per cent. of cases of mastitis.

Winckel,[1] in 1869, noted among one hundred and fifty women seventy-two cases in which there were fissures of the nipple; they were about as frequent among multiparæ as among primiparæ.

Pingat gives an account of fifty-three abscesses of the breast,—nineteen during the first month of lactation, fourteen during the second, three during the third, and seventeen during the tenth month. He also cites the statistics of Dr. Barr, from L'Hôpital Saint-Louis, from 1889 to 1891, showing among 1503 nursing women twenty-nine cases of lymphangitis and two of abscess. From Tarnier's ward, during the years 1888 and 1889, among 1235 confinements there were twenty cases of lymphangitis, sixty-three of fissure or engorgements, and four of abscess or galactophoritis. From 1890 to 1891, among 1727 confinements there were fifty-four fissures, fourteen eruptions from bichloride, and three abscesses. In the latter series bichloride was employed in place of boric acid, used in the former series.

The cause and method of infection in mastitis are questions full of interest and involved in much discussion. The opinion used to be strongly held by such eminent authorities as Velpeau, Chassaignac, and others of their time, that infection resulted from engorgement of milk, either from over-secretion, narrowness of the milk-ducts, or insufficient suction.

Orth says that there is no doubt that mastitis results from pathogenic germs, the chief of these being the staphylococcus and streptococcus. Delbet takes the position that mastitis may have its origin through both the milk-ducts and the lymphatics, holding that the milk-ducts are the more common channel, since in the beginning both pus and milk can be pressed from the nipple. He asserts that infection may be lobular without the axillary glands becoming involved. Engorgement alone will not produce mastitis. This is shown by stopping the milk-ducts experimentally with collodion, as has been done by Kehrer, and by ligature of the ducts, as performed in dogs by Delbet. Another evidence that engorgement does not produce abscess is cited by Pingat,[2] in the fact that supernumerary breasts remaining after enucleation of the normal breasts become engorged in subsequent pregnancies, but never give rise to abscess. Pingat further says of the two theories held concerning the entrance of infection, that whereas it may enter through cracks or excoriations along the lymph-channels, in the absence of these (although favored by their presence) the microbes may follow up the milk-ducts to the acini, where they may multiply and finally find their

---

[1] Die Path. und Therap. des Wochenbett, 1869.
[2] Pingat, Thesis on Abscess of the Breast, Paris, 1891.

way into the cellular tissue. This theory is strengthened by the fact that mammary abscesses occur in cases where neither fissure nor ulcer can be discovered.

Speaking of germs, Orth says that they may enter by the milk-ducts (as occurs in infection of the parotid gland), by the lymph-channels, or by the blood vessels. He says that while it is unquestionably true that infection may enter through fissures in the nipple, it is probable that different germs follow different channels, streptococci entering by the lymph-channels and staphylococci by the milk-ducts. It is no more remarkable that the germs should travel against the milk-stream than it is that they should travel from the bladder to the kidney. He states that staphylococci are found in the milk-ducts of healthy women, and that although retention is not a cause of mastitis, when present it is a condition favoring the multiplication of germs.

Various investigations have been undertaken in order to determine whether bacteria may exist in normal milk. This is rendered probable by the well-known fact that micro-organisms enter the blood in connection with tubercle, typhoid fever, rabies, etc. Escherich made bacteriological and culture examinations of nine normal cases, in all of which he found the milk to be sterile. He examined five cases with fissures or excoriations, accompanied, however, with other slight inflammation of the gland, and healing rapidly under treatment. In four of these he found staphylococci. He believes that the infection commonly takes place through the milk-channels, and says that staphylococci entering the blood through the infection of the genital apparatus may be excreted through the milk as well as through the urine.

Orth says that the staphylococcus albus may gain entrance into the outer milk-ducts and thus be found in the first milk secreted. Pathogenic germs, he says, may unquestionably be secreted with the milk of septic women, but it is still uncertain how deleterious they are to the infant.

Palleski examined twenty-two healthy nursing women and found the staphylococcus albus in ten cases, although every precaution was taken against error. The presence of germs was not dependent upon the length of lactation or the time elapsing after nursing. He says that in the milk of perfectly healthy women perhaps half of the cases contain micro-organisms belonging to the cocci, and he believes them to be the staphylococcus pyogenes albus. He is uncertain whether they gain entrance from the blood or from the external air. He is sure, however, that the staphylococci may be present in milk in considerable quantities without any appearance of mastitis or general disease.

Karlinski[1] states that micro-organisms from the interior of the uterus in the process of involution can be found in the blood; that offspring among animals suckled by infected mothers die in a large percentage of

---

[1] Prager Medicinische Wochenschrift, 1890, p. 279.

cases; and that, as the infection of the mother does not occur until after parturition, the infection of the child must occur through the milk.

It thus becomes evident that in the opinion of a majority of observers micro-organisms may exist normally in the milk, chief among these being the staphylococcus pyogenes albus. It is held that septic germs may gain entrance through the air and probably also through the blood of the general circulation. It seems probable that they are the source of infection in mastitis, and that they may gain entrance in three ways,—viz., through the milk ducts, through the lymphatic channels, and through the blood-vessels.

In mastitis, according to Orth, usually only a part of the breast is affected at a time, although successive portions may become involved. The outer and lower portions are those most commonly affected. The chief disturbance is in the connective tissue surrounding the acini, and when the cells of exudation enter the milk-ducts this is only a secondary manifestation; if the inflammation has its origin in the milk-ducts, with early suppuration, it may be called a purulent galactophoritis. At first small abscesses form, which later enlarge and coalesce; the gland parenchyma may remain longer and give a nodular appearance to the breast. Fistulæ discharging milk may result from the inflammation.

Billroth holds it as probable that the phlegmonous material is carried by the lymph-stream into the breast, and through the medium of the white blood-corpuscles finds its way into the lobulus and acini. He considers this theory more probable than that of stasis or infection of milk-ducts. The origin of infection may come from various sources. Delbet suggests that it may come from the mouth of the infant, from ophthalmia, or from the hands of the mother herself. Pingat suggests the same, and cites an epidemic of lymphangitis occurring in Tarnier's wards which was found to have arisen from a nurse who had a felon. After this had been properly dressed the epidemic ceased.

As to the prognosis in cases of mastitis, Billroth says, *quoad vitiam*, it is not grave: he had observed fifty-six cases, with two deaths. One of these had erysipelas and the other had septic thrombosis of the femoral vein when received into the hospital.

The fistulæ following mastitis are difficult to heal.

One argument in favor of the retention of milk being the source of mastitis has been that in the pus discharged after the incision of abscesses of the breast milk has been present. It seems more probable, however, that the incision itself, while opening the abscess, may at the same time have opened certain of the milk-ducts.

Galactophoritis is an inflammatory condition of the milk-ducts, which is to be distinguished from a general mastitis by the fact that the induration of the breast is less extensive and it is possible to press out from the nipple small quantities of pus. M. Dudin, in his lectures in 1888, recommends as a treatment for galactophoritis to use pressure perhaps twice

daily upon the breast, in order to squeeze out carefully as much pus as possible, and, after thorough cleansing, to support the breast by a carefully-applied dressing and bandage. M. Le Groux, of the Hôpital Trousseau, recommends in such cases that a plaster be applied over the entire breast except the nipple, and that the purulent secretion be drawn off with great care by means of the breast-pump.

The methods of treating mastitis which are recommended are both prophylactic and curative.

The method employed by Tarnier is, in the last month of pregnancy, to exert careful traction upon the nipple twice daily, increasing the amount of traction a little each day : one must desist should this cause uterine contractions. Great care must be taken to have the hands clean. Afterwards a pomade of almond oil, cacao butter, and tannin in equal parts is applied to the nipple. Others recommend alcohol or astringent lotions.

Horne says that in all cases of threatened inflammation of the breast, or where it has already taken place, well-regulated pressure by means of an elastic bandage should be applied, and no attempt made to nurse or to withdraw secretion until the subsidence of the inflammation. As to the advantages of the elastic bandage over the ordinary roller, he says its application is more easy, the pressure is more uniform, it is not so likely to slip, it is more comfortable to the patient, it requires less material, and it is not necessary to apply it over the shoulders. During lactation, Tarnier's method is to wash the breast thoroughly with bichloride of mercury and apply a moist dressing saturated in 1 to 20,000 of the same. Before nursing this is washed away with a solution of boracic acid or common salt. If cracks are present, the child is applied to the affected breast less frequently than to the other ; if the cracks are painful, a five-per-cent. solution of cocaine is applied before nursing ; if they are exceedingly painful or inflamed, nursing is stopped for a time. Assistance may be gained in nursing by means of a shield. The affected breast is bound up and compressed. For fissures Tarnier considers all pomades undesirable.

In the treatment of fissures, Bonnaire recommends the application of nitrate of silver of the strength of 1 to 100 or 150. For fissured nipples, Hirst advises the use of an ointment of equal parts of oleum ricini and bismuthi subnitratis. Before its application the nipple should be thoroughly disinfected. The child may nurse without the removal of this ointment. For engorgement of the breast he applies lead-water and laudanum, giving the breast support by means of equable pressure. When nursing is abandoned, Pingat believes that special care should be taken in protecting the breast against micro-organisms. He suggests for this purpose that the breast be enveloped in cotton.

When mastitis has gone on to the formation of abscesses, the early and complete evacuation of the pus is of the greatest importance. Failure to effect this may result in extensive abscesses which are extremely difficult to heal and which produce serious results. Instead of opening the abscess,

Boeckel has suggested that the entire abscess be excised. He treated six cases of abscess in this way, with healing by first intention under a single dressing. Billroth makes an early opening in cases of ante- and retro-mammary abscess. He says that a difference of opinion exists concerning abscesses of the gland itself, and he recommends an early small incision, with drainage and antiseptic dressing, which can be left in place for three days and then removed. If the pus has decomposed, as it may do on account of the presence of milk, the opening must be more free, and the finger inserted into the abscess so that dividing walls can be broken down and the cavity thoroughly disinfected and drained. Even in such cases healing may go on rapidly. He considers antiseptic dressings, with press-ure, as very valuable, and nursing should be abandoned if it causes much pain or if there is much inflammation. He says that women often object to the opening of abscesses on account of the cost of milk should nursing cease, through fear of pain or of scars, and lest the stoppage of lactation might make possible another pregnancy. There is also a popular belief that a scar made by a knife is more serious than that resulting from a spontaneous opening.

Chronic Mastitis.—As distinguished from acute mastitis, Delbet cites chronic inflammations of the breast as occurring under three forms: the subacute, coming on gradually with more or less pain, and producing a tumor usually more tender on pressure than a malignant growth and with more definite boundaries, accompanied by enlargement and tenderness of the axillary glands; the resolving form, which may exist for a considerable time and then disappear; and the indurated form, which may remain for months or years, varying with each menstruation. As causes he cites, first, lactation, and, second, traumatism. The fact that enlargements come after pregnancy he considers as always significant of inflammatory origin, since malignant growths rarely appear at this time. In a case of my own an enlargement came on during pregnancy which presented many evidences of being inflammatory. The secretion of milk was abundant, and was stopped with difficulty. A little later the growth was so suspicious that it was removed, although signs of inflammation had not passed away, and it was found to be a rapidly growing carcinoma.

Orth says that a diffuse mastitis may occur involving the whole breast, coming on with symptoms of swelling, pain, and tenderness. Later this may result in contraction, which it may be difficult to distinguish from carcinoma. Billroth thinks that most cases of chronic induration and contraction of the breast which have been described as mastitis are really carcinoma. In his own experience he has met but one case of this sort which he thought might be chronic mastitis.

TUBERCULOSIS.

Orth says that it was formerly supposed that tuberculosis did not occur in the breast. It is now known that it is not uncommon. Billroth, in his

classic work, cites only one case, that of a woman who died of general tuberculosis.

MacNamara[1] says that the first case was reported in 1801 by Benjamin Bell, that surgeon stating that abscesses occasionally occurred in breasts which were mistaken for cancer. He also suggests that some cases which have been reported as malignant disease operated upon with cure may have been cases of tuberculosis. He thinks, however, that extirpation is the best treatment for tuberculosis. Orth says that tuberculosis is most common in women, and may begin before puberty or may occur after the menopause; it is most frequent, however, in advanced adult life. Pregnancy and parturition seem to favor its development. It may occur on one or both sides. It may result from tuberculosis of the ribs, and may be primary or secondary to tuberculosis of the axillary glands. Roux[2] cites Virchow as placing the mammary glands among the organs which are exempt from tuberculosis; he says that Cornil and Ranvier do not even mention tuberculous breasts. Velpeau, in his treatise in 1854, says that the breast is rarely the seat of cold abscesses which from their progress and appearance can be considered to be tuberculous. Sir Astley Cooper describes what he calls scrofulous tumor of the breast, saying that it progresses slowly and is confined to one breast. Roux discusses thirty-two cases of tuberculosis among women and two among men, the average age being thirty-one years, the oldest being fifty-two and the youngest sixteen. Of the thirty-four cases, seventeen had borne from one to eight children, in seven there was no record, and eight cases (two of whom were men) had not borne children. He mentions a case of a tuberculous mother who had lost five out of eight children from nursing them. It thus becomes evident that tuberculosis of the breast is a condition which has been fully understood but recently.

Dr. Welch, of Baltimore, in a verbal communication told me that several times he had, on examination, found breasts which were considered malignant, to be tuberculous, and said that he was of opinion that the condition was more common than is ordinarily recognized.

Delbet describes two forms of tuberculosis: the first is that in which there are isolated and distinct points of tuberculosis; the second is the confluent form. Ohnacker considers these two forms to be but different stages of the same process. He says that it is most common between the ages of twenty-five and thirty-five, that it never occurs before puberty nor after fifty, and that it does not depend upon lactation. Among twenty-six patients, twelve had no other tubercular lesion except that of the glands of the corresponding axilla, ten had pulmonary lesions, and four had other tubercular manifestations.

Roux (*op. cit.*) classifies the disease under three heads: 1, cold abscess; 2, disseminated tubercles; 3, confluent tubercles.

---

[1] Westminster Hosp. Rep., 1889.
[2] De la Tuberculose Mammaire, 1891.

Of the first variety, he says it resembles cold abscess elsewhere. The second begins in an obscure manner, being unaccompanied by pain and being rarely seen at an early stage. In this condition nodules may be felt in the interior of the mammary gland varying in size and number, and these nodules may reach the size of an almond. Enlarged glands in the axilla, and particularly along the border of the pectoralis major muscle, should suggest the presence of this disease.

The third form, he says, is the most common, is painless, and may be unaccompanied by tumor of either breast or axilla. The breast may be pendulous, somewhat enlarged, and the nipple retracted. In the upper and outer portion of the breast one may find an oval elongated tumor, indistinct fluctuation on deep pressure, and there may be little, if any, elevation of temperature. With the progress of the case the axillary glands usually become enlarged and an abscess forms. A considerable abscess may form by the confluence of several tuberculous points, and this may break through the skin and result in sinuses which are difficult to heal. The process begins in the acini with small, slow infiltration, and spreads to the surrounding tissue.

The disease may show itself first either in the breast or in the axilla, and may extend from one to the other. The diagnosis is very difficult, if not impossible, in the beginning, and the disease may be confounded with chronic inflammation. The most characteristic sign is the relatively early enlargement of the axillary glands, with tuberculous infection of the connecting lymphatic vessels. Later, when ulceration occurs, the diagnosis is easy. Tuberculosis has been confounded with suppurating cancer. Professor Welch, of Johns Hopkins University, related to me two such cases.

The effect of tuberculosis on woman's milk has not been fully investigated. Unquestionably, however, the bacilli are secreted with the milk of tuberculous cows and are a source of danger, and Welch suggests that the same may be true with reference to women.

As to the prognosis, it does not in itself threaten life, but leads to a gradual destruction of the breast. There is always danger, however, that it may involve other organs. The progress of the disease is slow in all three varieties, and is liable to be unfavorable without surgical intervention, resulting in long suppuration and general tuberculous infection. The treatment should be the same as in other cases,—conservative if early, radical if late.

The treatment recommended by Delbet is the removal of a wedge-shaped piece in case of local infection, and the removal of the entire breast, together with the axillary glands, if this be necessary to eradicate the disease. He says that injections are of little value, and that incising, curetting, and cauterizing, though they may be attended with considerable benefit, result in long-delayed healing, and are correspondingly objectionable. Dubar,[1] in

---

[1] Tubercules de la Mamelle, Paris, 1881.

speaking of treatment, concludes that in the disseminated form of the disease the treatment should be palliative. In the confluent form there should be total extirpation of the breast, and proper medication should accompany both forms of treatment. Berchtold, working under the supervision of Professors Courvoisier and Socin, concludes that the rational therapy in tuberculosis of the mamma is total extirpation of the entire breast and dissection of the axilla, since a breast which is once tuberculous is always suspicious, and should never be used for lactation. He says that total extirpation of such breast is as clearly indicated as though the case were carcinoma. Lane reports two cases of tuberculosis of the breast, and concludes that it may occur without infection of the axillary glands.

It thus appears that tuberculosis of the breast, though not a common disease, is by no means rare; that, whereas it may be a local process, there is a tendency to become generalized. Its presence is a contra-indication to nursing, since it is probable that it may induce tuberculosis in the child. When of slight extent, incision, disinfection, and removal are in place; when the involvement of the breast is large, and is accompanied, as is often the case, with fistulæ and perhaps enlarged axillary glands, the entire breast should be removed and the axillary glands extirpated.

SYPHILIS.

The breast may be affected by the primary, secondary, or tertiary lesions of syphilis.

Primary lesions occur upon the nipple, where they may present their usual characteristics, and may result in destruction of the nipple itself. Delbet says that chancres may occur at the same time on both breasts, or may be multiple on one breast.

It goes without saying that secondary syphilides may be found upon the breast as well as elsewhere. Mucous patches have been observed upon the nipple as well as under the fold of the breast. Syphilitic papulæ may occur under the breast and may be of large extent. Of gummata nothing definite is known, and Billroth says that he has never seen a case. Gummata of the nipple are rare, but they may occur. Delbet further says that tumors the result of tertiary syphilis may occur in the breast; that they are round, movable, that the skin is not adherent or tender, and that they grow more rapidly than malignant tumors. The diagnosis is difficult at first, and is suggested only by a syphilitic history. As the tumor grows, it softens, inflames, and finally opens, the axillary glands becoming involved.

Neumann[1] says that syphilitic abscesses of the breast are rare, and that they occur only in the later stages of the disease. Rokitansky does not mention them. Cheever mentions a case in the *Boston Medical and Surgical Journal* which disappeared under iodides. Landreau, in describing the con-

---

[1] Allgem. Wiener Med. Zeitung, December, 1889.

dition, states that there is no special pain ; the breast gradually enlarges, is irregular, dense, and more or less nodular, not being tender upon pressure. After considering fifteen cases, Neumann says that the diagnosis lies between mastitis, neoplasms, and syphilis. Against mastitis is the absence of signs of inflammation. The fact that the tumor diminishes under iodides helps to exclude neoplasms. In favor of the diagnosis of syphilis are the slow development, the painlessness, the reddish color of the skin, the thin, cheesy pus which escapes when the tumor opens, and the fact that the latter is beneficially affected by iodides.

The treatment of syphilitic manifestations in the breast is the same as that of syphilis elsewhere.

The importance of the diagnosis is shown by the fact that syphilis may be contracted through the milk. On the other hand, offspring come under the law of Colles,—namely, that if a mother gives birth to a syphilitic child through the infection of the father, the mother having escaped infection, she is thereby protected against infection in nursing the child, and it is stated by Ehrlich that under these circumstances the nursing of such a child by the mother is without danger to the latter and is of great benefit to the former.

CHALKY CONCRETIONS.

According to Billroth (*op. cit.*), these may occur in the breast, but are very rare.

ANGIOMA.

These may occur in the breast, but are also very rare. I have observed one case presenting superficially the appearance of an angioma ; in the tissues beneath it, however, could be felt an enlargement. Upon its removal, the mass beneath was found to be an alveolar carcinoma.

CYSTS.

Cysts of the breast may be of different sorts, and there is no little difficulty in distinguishing between them ; under certain circumstances it is impossible to do so. A case in point was one in which I operated upon a woman, about thirty-seven years of age, having a cyst containing perhaps six ounces, which, upon being opened, contained a dark fluid resembling a broken-down blood-clot, the cyst having what seemed to be a simple wall, smooth and free from any unusual appearances. The incision healed, except a small sinus which persisted for some time. Gradually the walls of the sinus became indurated. A small piece removed later ·from this point of induration for examination proved to be carcinoma. The breast was immediately excised and the axilla cleared, and in the axilla were found numerous glands already infected by the carcinoma. This shows the difficulty and importance of diagnosis in case of cysts. Upon this point, Orth (*op. cit.*) says that it is difficult to distinguish between adeno-cystoma and simple cyst-formation. The former results in the development of cysts

59

in the newly-formed tissue; the latter is caused by the dilatation of the already existing canals by the pushing of tissue into them; thus ducts and even acini become greatly dilated. Billroth says that cysts come from dilatation of the milk-ducts, and that they may result from a collection of secretion such as sometimes occurs in the newly-born and in old women, or that they may be due to the degeneration of epithelium. They may be single or multiple, and a great many may occur in the same patient. They are rarely larger than an orange, and may be very tense and, if the patient is fat, difficult of diagnosis. He also says they may occur in new formations, such as a fibroma, and they are usually at the periphery of a gland, though they may be at its centre.

Among the rare forms of cysts Forbes records a case of papilliferous fibro-cystic adenoma of an aberrant breast-nodule, and remarks that S. W. Gross had a microscopic slide of a similar tumor.

Johnson reports a case of cystic disease of both breasts, the cysts being large and showing polypoid growths. Both were removed. In one there was a recurrence two years afterwards of a cyst-growth above the cicatrix. Billroth says that cysts may be accompanied by a discharge of brownish serum from the nipple. Extirpation is the best treatment; injections he considers unsatisfactory.

Galactocele.—Much was formerly said of galactocele and the importance of the retention of milk in the production of cysts of the breast. It is now considered to be of much less frequency than formerly, and relatively few well-authenticated cases are recorded. It becomes a question whether the cysts result from the rupture of ducts or from their dilatation. According to Delbet, the ligature of part of the ducts in dogs who still continued nursing caused no cysts. Most cases are reported as following an injury, and this is an undoubted cause. They usually grow slowly, with little, if any, pain. The contents may vary from a milky to a creamy or buttery consistency. They occasionally come at the close of pregnancy. The tumors are movable; the skin is not adherent. It may be possible to express milk. Their course is usually a slow one, and results in different ways. The cysts may increase with succeeding pregnancies or may be absorbed, or possibly they may suppurate.

According to Orth, galactocele may result from an inflammatory condition, usually coming during the process of involution. An interesting case of Scarpa's which contained ten quarts of fluid is cited by Billroth. Well-established cases containing large amounts are, however, rare.

Delbet says that galactocele may be confounded with cystic neoplasms, but the latter usually have a solid part in addition to the cystic portion. Should galactocele occur during lactation, nursing should cease; later, extirpation is the best method. Incision, with or without injection, is undesirable, since it is followed by long suppuration. Besides galactocele, the contents of cysts have often been described as composed of material resembling cheese or butter. Billroth doubts if these observations are correct,

and in a case of his own which was examined by Ludwig the contents were found to be emulsified fat.

Smita, however, gives the analysis of the contents of a cyst having the appearance of condensed milk, and showing the presence of casein, albumen, and sugar of milk.

It thus becomes evident that cysts of the breast are of various sorts and of various significance; and whereas they may be benign, they may be the beginning of malignant trouble and may occur in malignant tumors. They should always receive careful consideration, and when not multiple and distributed in both breasts they should be removed.

Cystic Degeneration, or Maladie Cystique of Reclus.—A disease was described by Reclus[1] in 1883 which was characterized by the appearance of multiple cysts in both breasts. Writing of the same disease in 1893, he says it is characterized by the existence of a number of cavities, large or small, so hard as to seem solid, and it is only by exploration that the presence of liquid can be diagnosticated. These cysts pervade one and often both breasts. The diagnosis lies between the cysts described and those arising from epithelioma. Whereas in his first article he advocated complete extirpation of the breast, in a later one he says that he is inclined to defer operation, unless there be evidences of malignancy, since numerous cases have followed a benign course. Delbet is inclined to consider this disease of inflammatory origin, and thinks it is the same as that which had previously been described and illustrated by Cooper. Koenig holds to the same opinion. Delbet's idea is that the cystic condition is secondary to a chronic inflammatory one.

Schimmelbusch gives Reclus the credit of having described the disease as typical, rather than as a rare condition. The points of diagnosis, as he lays them down, are the multiple small cysts, their almost sure affection of both breasts, and the fact that they are not connected with neighboring tissues, especially the skin. He cites a case in Von Bergmann's clinic in which both breasts were involved. In one of these, in addition to this, there was a small mass the size of a pigeon's egg, the central portion of which was infiltrated with scirrhus. He cites seven cases observed in Von Bergmann's clinic, together with thirty-six collected from other sources; in three of these carcinoma developed itself. As to treatment, he agrees with other authors in holding that partial extirpation is useless, and that if extirpation is performed at all it should be complete. In patients advanced in years extirpation might be advisable; in those younger he would be inclined to keep the case under observation. He says that microscopic examination shows the cysts to result from a proliferation of the epithelium of the gland. The acini increase in number and are finally dilated and united. It differs radically from carcinoma, since the connective tissue is not invaded, but only pushed aside by the development of the cyst.

---

[1] Revue de Chirurgie, 1883, p. 761.

While it is evident that this disease is one which had been observed by other authors, doubtless to Reclus is due the credit of having brought it prominently to notice. Although in the beginning extirpation was recommended as the sole treatment, as it is found that many cases run a benign course the advice of surgeons has become more conservative, being to observe cases for a time, particularly the young, whereas in those who are approaching or have passed the menopause it is questionable whether removal is not the safer plan, even though a certain number of operations be performed needlessly. Partial extirpation has proved of no value, since the disease continues to develop in the portions of the gland left behind.

THE CLASSIFICATION AND ORIGIN OF TUMORS.

Tumors have been variously classified by different authors. There are also many theories as to their origin. Neither origin nor theories of classification can, however, be looked upon as settled, and there is a constant tendency to add new varieties to those which have already been described. Perhaps no better division can be made than into, first, those having the type of connective tissue; second, those having the type of epithelial tissue; and, third, tumors of a mixed type.

The first class—namely, those having the type of connective tissue—are of two sorts. The first of these are the benign, being analogous to normal tissue, and include the fibromata, lipomata, and chondromata. The other class of connective-tissue formations are atypical, although they have their prototype in the normal connective tissue. To this class belong the sarcomata. Myxomata are variously classed by some under the first and by others under the second division. To the second class of tumors, having their prototype in epithelial tissue, belong the adenomata, which may be regarded as typical, and the carcinomata, which may be regarded as atypical. The mixed tumors are various combinations of those mentioned, as, for instance, fibro-sarcoma and adeno-sarcoma, and cases are reported in which it is believed there is a mixture of sarcoma with carcinoma. In addition to these three classes of tumors are new growths, such as angiomata and neuromata, and there are cysts, formed, first, by retention, second, by degeneration, and third, by parasites, among which is the echinococcus.

The theories as to the origin of tumors vary widely, and the older ones need not be mentioned.

First among the theories which attempted anything like a scientific explanation was that of Johannes Müller. This was that tumors had their origin in the amorphous layer of the embryo called blastem, drawing their nourishment from the blood and lymph. The explanation given by Virchow is that they are the result of local irritation, causing more rapid growth of tissue. Thiersch regards epitheliomata as due to diminished resistance of tissue underlying the epithelium. Cohnheim[1] considered

---

[1] Councilman, Boston Medical and Surgical Journal, 1893, p. 147.

them to be due to the growth of remaining embryological structures through local stimulation.

It cannot, perhaps, be claimed that any of these explanations meets all the requirements of the case. They are, however, the best that have been offered up to the present time. As to the tendency to various tumors, Gross[1] says that the structural perfection of the mamma renders it most obnoxious to fibroma, sarcoma, and adenoma. Atrophy or decay predisposes to myxoma and carcinoma. He further says that the nearer the structures of the mammary tumor approach those of physiological adult tissues, whether they be connective or epithelial, the more innocent the growth, and that the more they depart from the normal standard the more malignant is the new formation.

Dennis[2] says the more embryonic the structure of the tumor the greater the liability to recurrence. Tumors which have structures departing but slightly from the normal correspond in every instance with a group of cases the clinical histories of which are favorable. Tumors which show a great departure from the normal structure correspond to the unfavorable clinical histories.

With regard to the production of epithelial growths, the question has arisen as to the origin of new cells, and opinions have varied as to whether these were the direct production of the epithelial cells already existing or resulted from the small-cell infiltration which surrounds malignant growths. Waldeyer says there is no evidence that the leucocytes found in cancerous tissue are transformed into cancer-cells, and that they are easily distinguished from these. He further says that, according to his observation, cancer-cells, and especially cancer-nests, have their origin in the pre-existing epithelium of the organ, while the stroma has its origin in the connective tissue.

Delbet (op. cit.) says that benign tumors of the breast are of glandular origin, and not pure connective tissue; otherwise, why should they develop more frequently in the breast than elsewhere? He thinks connective tissue and glandular elements develop together; hence he classes them as adeno-fibroma and adeno-myxoma. Williams[3] states that in the whole body 54.5 per cent. of malignant neoplasms spring from the archiblast (epithelium) and only 9.5 per cent. from the parablast (connective tissue). On the other hand, in the breast 77.6 per cent. spring from the archiblast and 4.1 per cent. from the parablast. He holds that inasmuch as the archiblast tissue retains more closely the embryonic type than do other tissues, where stimulated to unnatural physiological development, as in the uterus and mammæ, it is especially prone to take on malignant growths.

He gives the following statistics of 4597 cases of neoplasm. In men

---

[1] Gross, Tumors of the Mammary Gland, p. 35.

[2] Transactions of the American Surgical Association, 1891, p. 19.

[3] British Medical Journal, September, 1892.

the disease occurred in the mammæ in 0.5 per cent. of cases. Of 9227 cases of neoplasm in women, 26 per cent. were in the breast, 28.7 per cent. in the uterus, and 8.7 per cent. in the ovaries. Thus, the reproductive organs in women are attacked in about 70 per cent. of cases. Throughout the body the proportion of malignant to non-malignant neoplasms is 64 to 36; in the breast it is 81.7 to 18.3. He also says the influence of sex in the development of neoplasms is very great, the proportion occurring among males being about one-half that among females, or 33 to 67. In the breast, however, 99 per cent. of all neoplasms occur in females and only 1 per cent. in males. The following table will show the relative proportion of various neoplasms:

	Neoplasms in general.	Breast Neoplasms.
Cancers	54.5	77.6
Sarcoma	9.4	4.1
Non-malignant	24.7	15.7
Cysts	11.4	2.6
	100.0	100.0

Various experiments have been made in order to establish whether tumors are contagious or not. All attempts at inoculation made upon human beings thus far have failed, as well as most attempts of the same sort in animals. A few upon animals, however, have succeeded. Among them is one of Wehr's, presented at the German Surgical Congress in 1889. A carcinoma had been produced in a dog by inoculation, and the tumor had grown until it destroyed the dog, presenting unquestionable evidences of carcinoma. As to the contagion between human beings, Guelliot collected twenty-three cases of cancer of the penis among men whose wives had cancer of the uterus. On the other hand, Demarquay collected one hundred and thirty-four cases of cancer of the penis, in only one of which did the wife have cancer of the uterus. In conclusion, Duplay and Gazin are cited as saying that although we have no evidence of the direct contagion of cancer, we are none the less convinced of the infectious nature of cancer through a process of which we are entirely ignorant.

They further say that, from their own results and those obtained by numerous other experimenters, they believe that there does not exist a single fact authorizing us to conclude that cancerous neoplasms are directly transmissible from one species to another.

The possible influence of bacteria in the production of tumors is a subject which has of late attracted wide attention and has been the source of a vast amount of experimentation. The origin of this was the discovery of certain formations, called coccidia, in the liver of the rabbit, where growths are produced resembling epithelial new formations. Their discovery suggested the possibility that carcinoma in general might be the product of bacteria. The present status of opinion concerning this has

been admirably summarized by Councilman.[1] He says that various forms of bacteria may be found in carcinoma as well as in other portions of the body. They may produce inflammation or necrosis, but there is no evidence that they have any causal relation to the tumor.

In the rabbit's liver is found a species of protozoa or coccidium which produces nodules. These nodules are of the type of adenoma, and an analogy has been drawn between them and certain parasites found in carcinoma. That these were parasites and not bacteria was first pointed out by Thoma. These forms are variously described, and can hardly be considered as established, certainly not as the cause of carcinoma. Klebs says that experiments up to the present time as to the origin of carcinoma have produced no definite results. Culture experiments have demonstrated a series of bacterial organisms in carcinoma, but without sufficient constancy to give them pathological significance.

It is, however, by no means demonstrated that there are no carcinoma parasites, since it is possible there may be parasites the nature and cultivation of which are not yet understood.

Coley,[2] in a very interesting article upon the treatment of sarcoma by inoculation with erysipelas, says there is strong evidence of the bacterial origin of malignant growths. Kruse concludes that one must exercise great caution in accepting coccidia as the cause of malignant disease, since it is easy to mistake changes in the cells themselves, or the presence of normal elements, for what have been termed coccidia or psorosperms. Councilman (op. cit.) concludes that parasites present in tumors must be considered as accompanying rather than causing them. He says it seems impossible that carcinoma should arise from parasites, since metastatic growths take on the structure of the original tumor rather than that of the tissues in which they grow. This would hardly be the case if they were due to parasites. In this connection it may be remembered that Billroth has pointed out that while in the axilla metastatic growths have the same structure as in the mamma, metastatic growths occurring elsewhere may have a very different structure.

CONNECTIVE-TISSUE FORMATIONS.

Although chondroma and osteoma have been considered as occurring in the breast, they are extremely rare growths. Billroth cites one case of Sir Astley Cooper's as the only fairly established observation. Delbet says of them that they are probably a small amount of cartilaginous material developing in other tissues, or that they may invade the breast from the ribs. He also says that calcification may occur. Coen reports a case of "condro-osteo-carcinoma della mammella muliebre." Orth (op. cit.) says that chondroma and osteoma and mixed forms with sarcoma and carcinoma are rare in men, but that the form is not rare in dogs.

---

[1] Councilman, Boston Medical and Surgical Journal, April 20, 1893, p. 393.

[2] American Journal of the Medical Sciences, May, 1893, p. 488.

Cysts having walls with calcareous infiltration may be mistaken for osteoma.

LIPOMA.

Lipomata when occurring in the vicinity of the breast are usually separate from it. Delbet cites two cases of lipomata interlacing with the tissues of the gland. Billroth thinks that lipomata usually develop outside of the gland and push it to one side. If these are superficial, their diagnosis is easy; if underneath the gland, it may be difficult. Their removal when the growth is isolated is similar to that of lipomata elsewhere. A. P. Dudley reports the removal of a lipoma by an incision below the breast after the method of Thomas, thus avoiding deformity. Orth makes a division which he calls "lipoma capsulare," due to the increase of the fat surrounding the mamma. If the increase of fat follows a chronic mastitis, with contraction, the nipple may be drawn inward and given the appearance of scirrhus.

ADENOMA.

The classification of tumors belonging to the type of adenoma is attended with considerable difficulty. By some they have been classed as pure adenoma; by others many of them have been considered to be

FIG. 4.
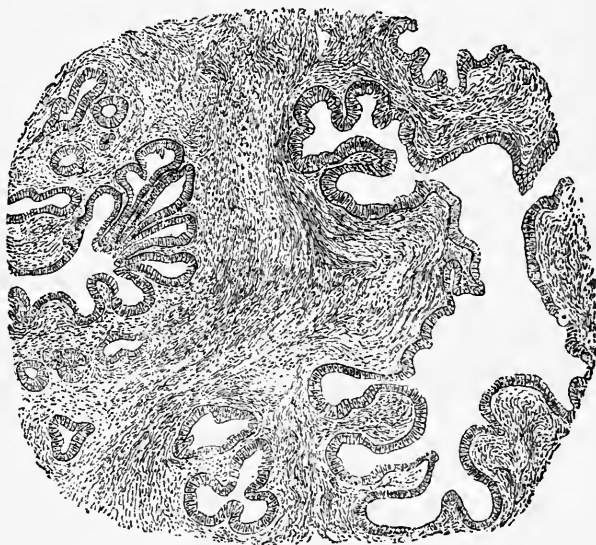
Adenoma. (Orth.)

fibroma. There are probably tumors belonging to both of these classes, but the weight of evidence seems to be that they should be considered as mixed types, and perhaps the best designation for them is adeno-fibroma.

Orth, in speaking of such tumors, says that connective-tissue tumors may develop from the adventitia of the milk-ducts or from the surrounding

connective tissue, or there may be combinations of these forms, accompanied also with increase of gland-substance. Pure adenomata are rare; mixed tumors are most common as adeno-fibroma, adeno-myxoma, adeno-sarcoma, etc. Gross (*op. cit.*) says that, when typical, the new acini preserve their natural form, size, and central lumen, containing a relatively small amount of connective tissue. There is a marked tendency for them to become cystic. He further says that adenoma is more rare than any other growth except myxoma, since he found only two among six hundred and forty-nine cases of tumor of the breast. They have their physiological proto-type in the breast preparing for lactation. He elsewhere says they are always solitary. Adenomata are usually ovoid, with nodular outline, and when not cystic are hard. Although limited by a capsule, when of moderate size they are closely united to the breast. Patterson gives excellent illustrations of adenoma growing in the breasts of girls aged respectively twelve and thirteen years.

Adenoma may be distinguished from cancer by its being more circumscribed and having a more definite outline; this applies principally to adenofibroma.

FIBROMA.

Fibromata are much more common than pure adenomata. Billroth, in speaking of them, says that he never saw a case before puberty nor after forty. Their most common period is from sixteen to twenty-five, and they are usually small and hard and of slow growth. It is not improbable, however, that certain cases may in later years take on the form of soft sarcoma. Gross says of solid fibromata that the average age for their appearance is twenty-three years, twenty-one per cent. occurring before the sixteenth year and seventy-five per cent. before the thirtieth. Of cystic fibromata, he says that they are never seen before the sixteenth year, the average age being thirty-six years, and that only thirty-five per cent. occur before the thirtieth year. The solid forms grow slowly, whereas the cystic forms may suddenly take on rapid growth.

Schimmelbusch, in speaking of fibro-adenoma, says that in every case which he examined having the appearance of fibroma, glandular elements were found, proving the growth to be fibro-adenoma. These growths never invade surrounding tissue, and never recur. Subsequent tumors, should they recur, must be regarded as new developments. They must be distinguished from sarcomata: sarcomata form cysts in their interior, but do not contain certain gland-elements, while fibro-adenomata have in their interior glandular elements.

According to Gross, adenomata may be confounded with fibromata, but the latter are more movable upon the mamma, more circumscribed, and not so decidedly bossed. Speaking of the openings in tumors of the character of fibromata, Orth says these may be due to a simple dilatation and destruction of the existing ducts. Into these ducts tissues may be pushed having connective-tissue basis covered with epithelium, which gives them,

on cross-section, the appearance of being papillæ. This gives rise to a
tumor which has been called fibro-adenoma cysticum, arborescent sarcoma,
fibroma intracanaliculare, adenocele, etc. The openings in these may be-
come so large that they may be seen and followed with the scissors ; the cut
section may resemble a cabbage. The tissue pushing into the canals may
break into them, and even through the integument. The cut surface will
vary in appearance according to the preponderance of glandular, con-
nective, or myxomatous tissue. The cyst contents may be viscid or of a
jelly-like consistence. The fluid may contain cholesterin or may be tinged
with blood. Rarely, epithelial pearls are formed from the hardened epi-
thelial masses, coming probably from ducts instead of from the acini.
The mixed adenomata are usually freely movable at first and the skin is
not involved, though later the cysts may break through and cauliflower-like

FIG. 5.
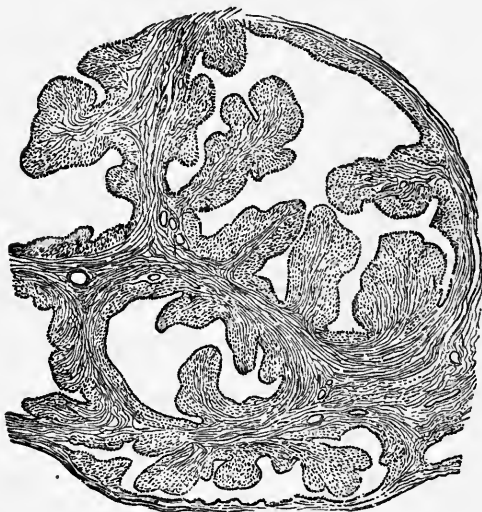
Intracanalicular fibroma. (Orth.)

masses protrude. The mixed adenomata must be classed with the benign
tumors, since they cause no metastatic deposits. They may, however, be
multiple in the same or both breasts, and thus other growths appear after
one has been removed.

An interesting lecture upon adeno-fibroma is given by Duplay. With
reference to pain, he says that when it is present at the beginning of a
tumor it is characteristic of a benign rather than of a malignant growth.
He classes adeno-fibromata under three heads : 1. Adenoid tumors abso-
lutely distinct from the gland, giving the sensation of a lymphatic gland.
2. Those which have evident connection with the gland. 3. Those which
are surrounded with gland tissue.

It is a question if certain cases may not later develop into sarco-
mata, and he advises as the sole treatment their removal, saying that the

removal of the entire breast is necessary in those cases in which the surgeon fears transformation of the tumor into a sarcoma. In cases in which the tumor is wholly surrounded by gland tissue it is necessary to remove the entire breast; in cases in which the tumor is nearly or quite independent of the mammary gland a circumscribed operation is indicated. Bennett, in speaking of chronic tumors of the breast, strongly urges the removal of adenomata and fibro-adenomata, since he thinks that there is danger lest they should degenerate into sarcomata, and cites a case of this sort.

In cases of my own of adeno-fibromata of both breasts the growths were removed through curved incisions corresponding to the fold beneath the breast, so that after the operation, when viewed from in front, no scar could be seen. This is a desirable consideration in young ladies, among whom such growths are most common. The operations are usually easy, since the tumors can, as a rule, be enucleated with little destruction of tissue. In another case Dr. I. N. Himes and myself removed the mammary gland from a woman aged fifty-three years. Thirty years before she had been told that the growth was innocent, and was advised to let it alone. She insisted on its removal, on account of the advent of pain and fear lest it might be malignant. The mass proved to be spherical, one and one-half inches in diameter, with a shell of bony hardness having a thickness of from one line to one-eighth of an inch; the interior was composed of friable tissue. Microscopic examination showed this tissue to be made up largely of connective-tissue fibres. Distributed through it were openings filled with lime salts, the arrangement and form of the openings giving to the mass the appearance of an adenoma. My opinion is that the tumor was an old encapsulated adeno-fibroma which had undergone changes from its long enclosure in its bony covering. The wall or shell surrounding the growth, like the shell of an English walnut, showed the following analysis, as made by Professor Perry L. Hobbs: lime, 37.16 per cent.; carbonic acid, 2.98 per cent.; phosphoric acid, 29.86 per cent.; the remainder was organic matter and moisture. The analysis shows the structure to be bone rather than calcareous matter.

A growth called plexiform fibroma is described by Nordmann. It is a condition of increased connective tissue occurring about the milk-ducts, and is most common in women above fifty years of age. He describes fourteen cases, and considers them different from other forms of fibroma heretofore observed. Thirteen cases were gathered from five hundred autopsies performed during two and a half years.

SARCOMA.

Sarcoma, next to carcinoma, is one of the most important diseases occurring in the breast. Its origin is obscure and has been assigned to many causes, such as traumatism, inflammation, heredity, etc., but none of these is thoroughly established as its cause. It is classed as belonging to

the connective-tissue type of tumors, and this has been considered one of its positive characteristics. Exceptions to this have been cited by Billroth. He states that sarcoma, myxoma, and lymphoma may in rare instances have an alveolar formation, so that this formation cannot be looked upon as absolutely characteristic of carcinoma.

This exceptional occurrence in sarcoma is so rare that the rule remains that its chief characteristic is the relation which it bears to connective tissue.

Sarcomata are grouped in various ways. For our purpose the following grouping will answer : Fibro-sarcoma ; round-celled and spindle-celled sarcoma, and forms combining the two ; soft sarcoma and cysto-sarcoma ; giant-celled sarcoma ; melanotic sarcoma ; osteo-sarcoma.

Before sixteen years of age, Gross says, we find only fibromata and sarcomata, the former being twice as common as the latter. Fibromata are always solid and grow slowly, while sarcomata are cystic in three-fourths of all cases and medullary in the remainder : hence cystic and medullary tumors at this age are sarcomata and nothing else. The youngest age at which they have been observed is nine years, and the oldest seventy-five.

In speaking of fibroma and fibro-sarcoma, Billroth says that there is a layer of hyaline, dense connective tissue, rich in nuclei, surrounding the acini and small excretory ducts. It is from this tissue that fibroma and fibro-sarcoma develop. What others have described as adenoma of diffused form he says should come under the head of fibro-sarcoma, the cysts resulting from the dilatation of the excretory ducts.

Gross says that of sixty examples which he had collected of sarcoma, forty-five were spindle-celled and fifteen round-celled. The most common subdivision is the cystic, these forming nearly six-tenths of those operated upon. Next come the myxomatous and telangiectatic. Spindle-celled tumors are more solid than round-celled, but both may be soft and cystic. In a later work he says spindle-celled sarcomata include 68 per cent., round-celled 27 per cent., and giant-celled 5 per cent.; 50 per cent. are cystic and 50 per cent. solid. Of ninety-two cases studied, 64.83 per cent. showed malignant features. Recurrence was most rapid in round-celled sarcoma, being in four months and twenty days; in spindle-celled, recurrence took place in eleven months and twenty-seven days; in giant-celled, in twelve months and ten days; in cystic, in eight months and five days; in simple, in thirteen months and nine days : the average time for recurrence in cystic round-celled sarcoma was three months and four days; in simple round-celled, six months and eight days; in cystic spindle-celled, nine months; in simple spindle-celled, sixteen months. Of twenty post-mortems, twelve showed secondary metastatic deposits. Before the age of thirty-five, small slowly-growing sarcomata do not return, while rapidly-growing and especially cystic ones are liable to do so.

Round-Celled Sarcoma.—Round-celled sarcoma is of more rapid growth than adeno-, fibro-, or spindle-celled sarcoma. Poulsen says that

among fourteen of his cases the sarcoma was movable under the skin, and the skin was adherent in twelve cases; in two the nipple was retracted, and in two the tumor was adherent to deeper structures.

Gross says that round-celled sarcomata are very malignant and that the prognosis as to their recurrence is grave. Among ten operations, eight had recurrences; of the two remaining, one died in two and one-half years of another affection and the other was alive after ten months.

FIG. 6.
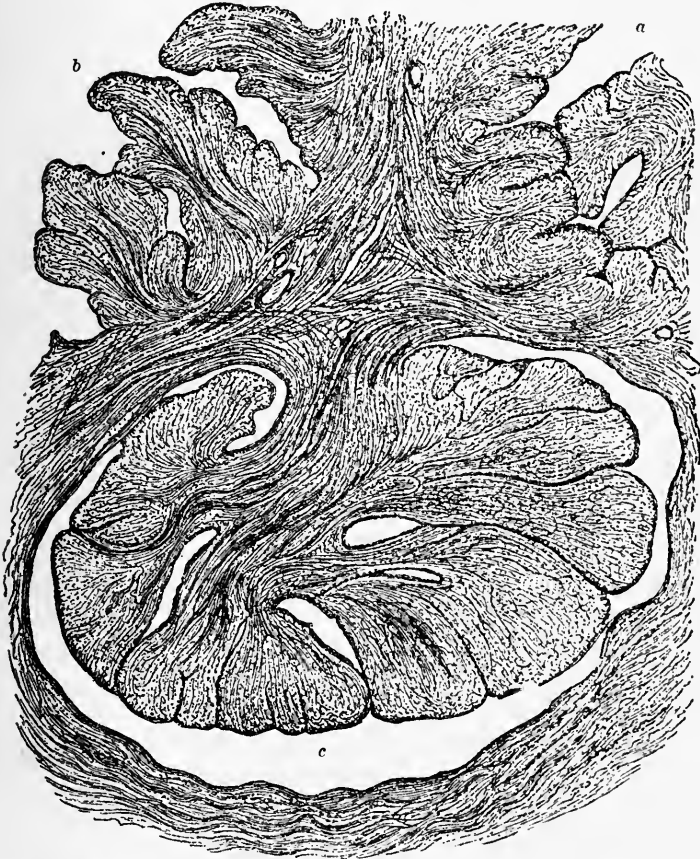
Proliferating cysto-sarcoma.—*a*, termination of an acinus; *b* and *c*, the tissue between the acini taking on increased growth and pushing into and dilating the acini into cysts. (Billroth.)

Spindle-Celled Sarcoma.—Billroth says that he never saw a pure and unmixed case of spindle-celled sarcoma and myxo-sarcoma. Steinberger, citing the above from Billroth, says that he observed one case of pure spindle-celled sarcoma. Gross mentions sixteen examples of spindle-celled sarcoma: five patients were living at periods of from a few months to twenty-six months, and one after five years, although the axillary glands were enlarged. The remaining eleven had local or general recurrences.

Thus, of twenty-six cases of round-and spindle-celled sarcoma which Gross cites, six were living free from disease an average of two years, one died without local return of the disease, and nineteen had recurrences.

Soft Cysto-Sarcoma.—In speaking of soft sarcomata, Billroth says that they may come at any age, from puberty to the sixties. They appear as small lumps, growing at first slowly and later rapidly. They are difficult to differentiate from cysto-sarcomata. The axillary glands may or may not be involved; recurrences are rapid, and death is usually early, but has been deferred as late as one year. Early writers classed all soft growths, both carcinomata and sarcomata, as encephaloids. Billroth also says that he considers cysto-adenomata as belonging properly with the class of cysto-sarcomata. Speaking of proliferating cysto-sarcomata, he says that they begin in the connective tissue between the terminal acini. This class of growths gradually obliterate the divisions of the acini, thus forming cavities. The epithelial covering may increase and then degenerate, and thus form cysts, and the connective tissue itself may become myxomatous or lymphoid, or, rarely, spindle-celled. Such cases may involve the glands and form metastatic deposits, but this is rare. Thirteen cases of operation for the removal of cysto-sarcomata are reported by Poulsen. In nine of these amputation of the breast alone was made; in two the tumor only was removed; in two there were amputation of the breast and clearing of the axilla; of the last two, the axillary glands were diseased in one and not involved in the other. In neither could the glands be felt before the operation. Of the thirteen patients, nine were living and free from recurrences after two and one-half, six and one-third, seven, nine and one-half, eleven, twelve, and fourteen years, among them being the case mentioned with enlarged glands in the axilla. In two cases recurrent growths were removed; three cases died of metastatic deposits, and one case died of pneumonia ten years after operation. Thus, the prognosis is not unfavorable in cysto-sarcoma, since seventy-five per cent. were living after five years.

Melano-Sarcoma.—Melano-sarcomata, though occurring from time to time, are rare. Vieregge reports a case of a melano-sarcoma occurring in a male child. A small nodule the size of a bean, which was present at birth, showed signs of development at two years of age. On removal, it proved to be a melano-sarcoma, and recurred rapidly, being disseminated throughout the body and causing the death of the child.

Cases have also been recorded by Butlin and Billroth, the latter of whom says that he thinks all melanotic growths of the breast are sarcomata and not carcinomata.

Giant-Celled Sarcoma.—Orth says that both giant-celled and melanotic sarcomata are extremely rare. Billroth speaks of seeing a case containing giant cells which he thinks was sarcoma, though it was extremely difficult to distinguish it in places from carcinoma.

Osteo- and Chondro-Sarcoma.—These are also of very rare occurrence. Gross says that the average age at which they appear is thirty-

four, and that the few cases operated upon would indicate them to be the most malignant. of sarcomata. Bowlby, in an article on chondro-sarcoma, reports a series of cases recorded by Cooper, Cruveilhier, Müller, and Heur-

Fig. 7.
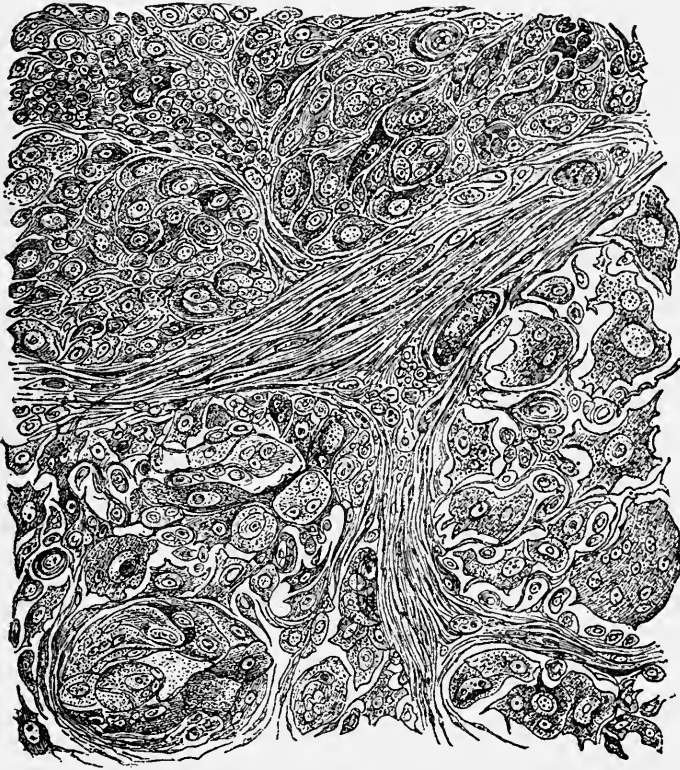
Alveolar sarcoma with giant cells. (Billroth.)

teaux, from the consideration of which he concludes that, while cartilage is very rarely met with in the breast, it may occur as an innocent growth or as a part of a malignant tumor. Professor Welch, of Johns Hopkins University, in an oral communication, says that most of the so-called osseous tumors of the breast are, in his opinion, calcareous infiltrations.

Growth of Sarcoma.—The growth of sarcomata seems to vary widely according to the character of the tumors and the age at which they develop. Gross says that their growth may be rapid or slow. Continuous growth indicates freedom from cysts, while sudden increase indicates accumulation of fluid. At a later period they may remain quiescent for years and then grow rapidly, suggesting that a fibrous tumor may take on sarcomatous changes. Sarcomata are usually solitary growths; in only a small proportion are they multiple. They are commonly free from deep attachments, and the skin, as a rule, retains its natural color and texture, the nipple is not retracted, and the lymph-glands are not enlarged.

As sarcomata increase in size cysts may appear and vessels of large size develop, the surface of the breast being rendered irregular by the protrusion of the cysts. The cysts may occasionally burst through the integument, causing a discharge of fluid and at times protrusion of fungous masses. In a case of cysto-sarcoma of my own (of the alveolar round-celled type) the tumor, after removal and the escape of the blood with a large portion of the cyst contents, weighed twenty-one pounds. It was so large as to rest upon the patient's knees before removal, and was equal in size to the largest cases of hypertrophied breasts which have been reported. Unfortunately, I could not secure a photograph. Before its removal, the cysts had burst through the skin and discharged constantly a large amount of fluid, which soaked the patient's clothing, even running down upon the floor. In this case the growth was slow for several years, later becoming rapid, and the development of the vessels from the axilla was very great, some veins being almost as large as the index finger.

As to the tendency of sarcoma to remain local or to become generalized, the statements of different authors vary considerably. Gross says that mammary sarcomata recur locally in 61.53 per cent. of all cases, and that 57.14 per cent. give rise to metastatic deposits. They are less infective locally than carcinoma, recurrence taking place in the proportion of 66 to 88.35 per cent., while they are more prone to produce metastatic infection, this occurring in the proportion of 57.40 to 50 per cent. In a later paper, reporting one hundred and fifty-six cases, he says that the lymphatic glands were enlarged and occasionally tender in nineteen cases. In sixteen of these enlargement was due to irritative hyperplasia, in ten of which there was ulceration of the tumor. The glands were infected in only three cases.

Speaking of the axillary glands, Snow[1] says that he never has seen a sarcoma with these glands infected. Poulsen[2] says that of the more solid sarcomata he had eleven patients, or 58 per cent., living and free from recurrences from four to sixteen and one-half years. In four of them local recurrences were removed. Eight cases of solid tumors, or 42 per cent., died. The axillary glands were involved in three cases; in all three cases swelling of the glands of the axilla could be felt. Two of them died, and in one the outcome was unknown. In none of the cases did the leaving of the axillary glands do harm, or, at any rate, were growths of the axilla removed afterwards. Of thirty-three patients with sarcoma, 63 per cent. were living free from recurrences, and 36.40 per cent. died with recurrences and metastases. Of the three cases of cysto-sarcoma in which he says that axillary glands could be felt, they were removed in but one case, and the patients all remained free from recurrences, so he concludes that the enlargement was a simple hyperplasia. Since, however, a diseased axillary gland was found in one case, and in another an axillary tumor appeared after three

---

[1] Lancet, London, May 6, 1893.
[2] Archiv f. Klin. Chirurg., 1891, p. 637.

years, he concludes that the axilla should be cleared, since the operation is not dangerous. Gould reports having operated on two cases of sarcoma with secondary growths in the axillary glands. Poulsen says, in the same connection, that the axillary glands were involved in only five cases of sarcoma ; the remaining cases have either remained well or died of metastatic deposits without involvement of the axillary glands.

The generalization of sarcoma differs from that of carcinoma ; for, while the latter extends chiefly through the lymphatic channels, the infection of sarcoma is carried in a greater degree by means of the blood-vessels. It is in this way that the metastatic deposits in distant organs are accounted for. Gross says that the sarcoma may even destroy the blood-vessels, so that the blood is contained in simple cavities in the sarcomatous mass.

Schmidt, reporting the method of operating pursued by Küster, says that in his service sarcomata were removed without clearing the axillary space. In discussing the results following operation upon sarcoma, Gross says that sarcoma occurring in a functionally active breast shows a marked disposition to return after operation, with less disposition to metastasis ; while a sarcoma of the declining breast recurs locally less frequently, but is generalized in the greater number of instances. He says that in all varieties, spindle-, round-, and giant-celled, recurrence took place in from 57 to 65 per cent. of cases, the solid recurring in 64.58 per cent. and the cystic in 51.16 per cent. The round-celled had metastatic deposits in 25 per cent., and the spindle-celled in 20.40 per cent. Repeated removals of the recurrent growths seem to prolong life, and the young do not seem to be more subject to recurrence than the old, nor to more rapid growths : thus, in fifteen cases, of from nine to nineteen years, the tumor had been in existence seven and a half years before operation ; 28.57 per cent. remained well, 71.43 per cent. recurred, and metastatic deposits were not observed in a single case. After thirty-five years of age, 43.45 per cent. recurred locally and 19.35 per cent. were generalized. Poulsen (*op. cit.*) reports thirty-three cases of sarcoma, or 9.3 per cent. of all mammary tumors. He found that recurrences or metastatic deposits occurred after solid sarcoma in 42 per cent., and after cystic sarcoma in 25 per cent. of the cases. Still, he thinks that the distinction between the two is not very sharp.

Treatment.—It is evident that the only rational treatment for sarcomata is their complete extirpation, on account of their tendency to local recurrence and to form metastatic deposits. Their early diagnosis is of the greatest importance. The operation varies little from that for carcinoma, except with reference to the clearing out of the axilla. While sarcomata have a marked tendency to recur locally, and to invade distant parts by means of metastatic deposits, they do not tend to invade the glands of the axilla, as do carcinomata.

A large number of operations which have proved successful are shown by statistics to have been confined to the removal of the breast, without

clearing the axilla. On the other hand, a considerable number of cases are reported in which the malignant growth has invaded the axilla. The inability to distinguish certain cases of sarcoma from other malignant growths must necessarily result in their operation by the most radical plan,—viz., that which is recommended in carcinoma. The only cases in which question will arise as to the method will be those in which the growth is small and seems to be strictly localized, and those in which it is so large and the patient's condition so reduced that it would be unwise to extend the operation more than is absolutely necessary. In these cases the removal of the breast is all that should be attempted ; in others it is still a question if it is not wiser, for the sake of added certainty, to clear the axilla, as is done in carcinoma. It is of great importance, however, in the operation to remember the tendency of sarcoma to recur locally, and consequently to make a radical and extensive removal of the tissues surrounding the growth.

MYXOMA.

Speaking of myxoma, Orth says that pure fibroma and myxoma are very rare. Gross considers myxoma synonymous with the net-celled sarcoma of Billroth, and places it among the most rare of connective-tissue neoplasms. He says that pure hyaline myxomata have their prototype in Wharton's jelly of the umbilical cord. They develop from twenty-nine to fifty-six years of age, the average time being the forty-sixth year, and grow more rapidly than sarcoma, but less rapidly than carcinoma. One third of the cases recurred, and metastatic deposits were not present. The growths are soft, and may simulate cysts. As a rule, myxomata are solitary, and grow continuously and rather rapidly. They are not bulky, are round or ovoid, are painful, have a limited attachment to the skin, but are movable on deep structures. They are unattended by enlargement of glands or superficial veins or retraction of nipple. They should be removed the same as sarcomata.

CARCINOMA.

The most important neoplasm occurring in the breast is carcinoma. Of its cause or prevention nothing is known. The old idea was that carcinoma drew to itself material which existed in the blood, and that the involvement of the axillary glands arose only after the tumor had lost its power thus to purify the blood. It was upon this idea that the giving of blood-medicines came into vogue, a practice which is still continued.

Various factors have been cited as influencing the development of carcinoma. Heredity has been considered as of very great importance, and extensive statistics have been collected in order to prove the truth or falsity of this belief. Winiwarter among one hundred and seventy patients found ten whose parents had had carcinoma. It must be remembered, however, that probably the records were incomplete, and Billroth, judging from his experience, is of the opinion that the proportion should be much larger. Gross among 1164 cases found that 8.5 per cent. had a family history of

cancer, whereas among the direct ancestors the proportion was 4.72 per cent., and in only one-half of these was the disease in the breast. Dietrich found evidence of heredity in 5.6 per cent. Oldekopf thinks that heredity is entirely overestimated as a cause of cancer, judging from his own cases. Dennis (*loc. cit.*) says that heredity may be assigned as a factor in developing carcinoma in twelve per cent. of all cases.

FIG. 8.
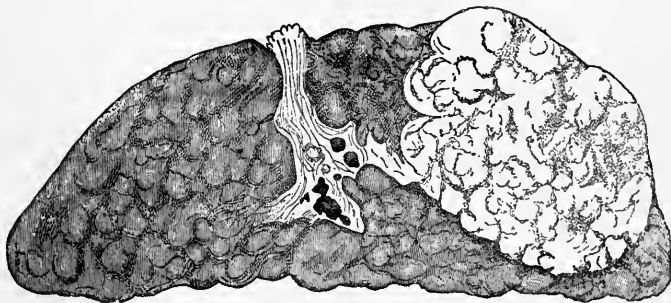
Acinous carcinoma (Markschwamm of Billroth; Encephaloid of Gross). (Billroth.)

Carcinomata of the breast differ considerably in their structure, growth, and malignancy. In the classification of carcinoma we cannot do better

FIG. 9.
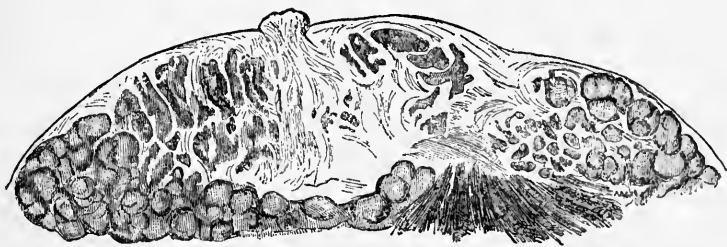
Carcinoma simplex (infiltrating cancer of Gross). (Billroth.)

than follow so eminent an authority as Billroth,—viz.: 1. Acinous carcinoma, partly hard and partly soft (Markschwamm; Gross, encephaloid

FIG. 10.
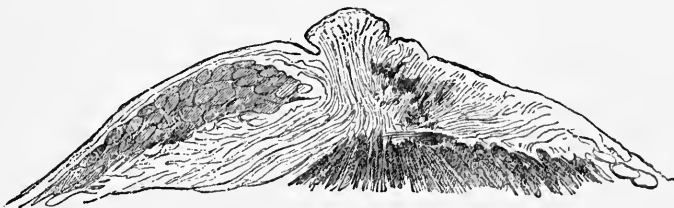
Scirrhus (atrophic scirrhus of Gross). (Billroth.)

or tuberous form of cancer); 2. Carcinoma simplex (Gross, infiltrating cancer); 3. Scirrhus (Gross, atrophic scirrhus); 4. Gallertkrebs (Gross, gelatiniform carcinoma).

Orth says that carcinomata may appear : 1, as isolated nodules ; 2, in a diffuse form, involving the entire mamma ; 3, they may arise from the nipple and flat epithelium ; 4, more rarely they may be formed of cylinder

Fig. 11.
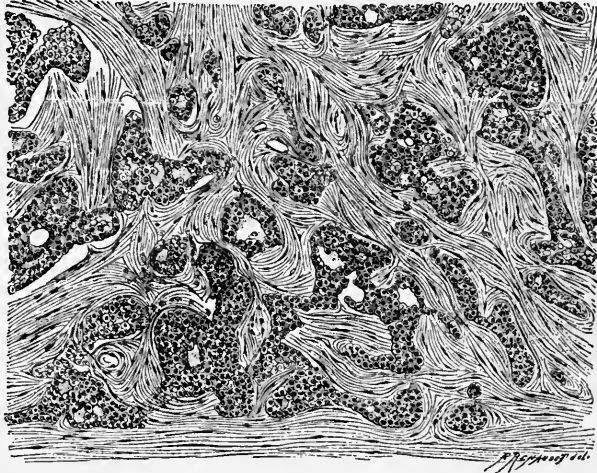
Carcinoma (common form).   (Duplay et Reclus.)

epithelium arising from milk-ducts and bearing close relation to adenoma ; 5, they may appear as papillary growths, coming in large solitary cysts, or adeno-cysto-carcinoma.   The beginning of carcinoma is probably usually in

Fig. 12.
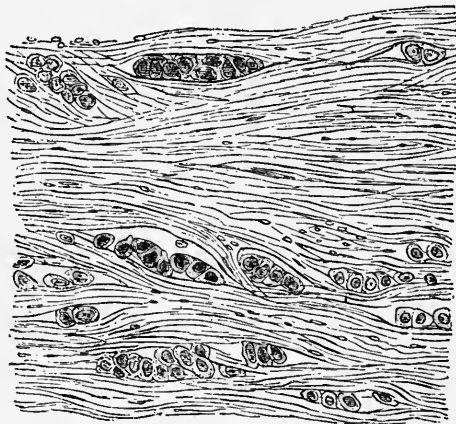
Scirrhus.   (Orth.)

the acini, which are later broken through as the disease extends.   The amount of connective tissue may vary widely from soft carcinoma to scirrhus, the latter being so dense that all epithelial cells disappear and only scar-tissue remains.   In the neighborhood of the carcinomatous tissue is a small-

cell infiltration. These cells differ in character from inflammatory cells or leucocytes, since they are simple granulation cells with a single rounded nucleus. The structure of carcinoma is usually alveolar, but may be tubular, or both may be associated in the same tumor. Sometimes the amount of connective tissue is very small and the alveoli are correspondingly large; at other times the reverse is true. Billroth says that carcinoma usually develops when the gland is undergoing atrophy or is already atrophied; this would make it seem improbable that epithelial cells would develop at this time. The epithelium of the milk-ducts is not, however, undergoing a similar degeneration, but at times shows a marked increase and produces an excretion.

Waldeyer says of the structure of carcinoma, that the alveoli are not closed cavities, but communicate with one another, and may be likened to a bathing-sponge. Orth states that the macroscopic appearances of tumors vary; those of acinous structure show on the cut surface projecting portions, and the acinous structure becomes apparent. They are grayish red, and a whitish cancer-milk rich in cells can be scraped from the cut surface. Hard cancer is often infiltrated; it has on section a gray surface, and bundles of connective tissue are plainly visible. On scraping the surface, few, if any, cells are found.

Dennis says that the histological character of the tumor itself influences, more than does any other cause, the recurrence of carcinoma of the breast. The more typical the structure the better the prognosis; the more atypical the structure the more unfavorable the prognosis. Gross says that the size of the tumor depends upon the elements present, it being large when cells predominate and small when the fibrous stroma is in excess.

One of the most important of the divisions of carcinomata is that of scirrhus. Speaking of this, Oldekopf says that it is most common in older subjects, while the alveolar is more common in younger. He states that the average age for the appearance of scirrhus is fifty-one years, and the average length of life with scirrhus is sixty months, while with alveolar carcinoma it is thirty-three and nine-tenths months. Billroth says that in advanced age scirrhus gives the best prognosis.

Ashhurst[1] says, "My own experience is, scirrhus invariably returns sooner or later. Cases in which it has not recurred have been those in which the patients have died of some other affection in the mean time." On the other hand, he says, "I have seen cases in which there has been no recurrence after six or eight years," and that "there are undoubted cases where the period of immunity has lasted as long as ten years."

Butlin[2] concludes that withered scirrhous cancer is not favorable for removal, since the disease almost invariably returns. On the other hand,

---

[1] International Clinics, Philadelphia, July, 1891, p. 114.
[2] Butlin, Operative Surgery of Malignant Disease, 1889.

left to itself, it may pursue a very slow course, and may last for years
without producing great local discomfort.

Speaking of gelatiniform carcinoma, or Gallertkrebs, Billroth says that
myxomatous tissue may be produced by epithelial cells or may result from
degeneration of the connective tissue. Doutrelepont thinks it is a substance
poured out by the vessels, usually going to the production of cells, but here
producing myxomatous material. Rindfleisch agrees with the last explana-
tion. Orth says of this growth that the central portion is the part usually
degenerated, while the periphery may retain its normal characteristics. It
is not a simple degeneration from the disturbance of nutrition. Fatty
degeneration, however, may occur, and can be distinguished by yellow
points and by its structure. This may go on to the breaking down of
tissue, or, on the other hand, connective tissue may increase and by contrac-
tion retract the nipple. Calcareous degeneration at times occurs. Chole-
steatomata are formed from hardened epithelium in the gland-substance,
and as such have no connection with cancer.

Hemorrhagic conditions may occur in connection with carcinoma of the
breast, presenting the appearance of hæmatoma or of angioma. Willett
describes two cases of hemorrhagic carcinoma of the breast, neither of
which presented anything unusual before operation, except that the tumors
were rather soft. On removal, the cut surface of the tumors was found
to be dark red, due to extravasation. This was not generally diffused
over the tissues, but was sharply defined by the margin of the malignant
growth itself; the microscopic appearances were those of an encephaloid
carcinoma. The blood was among the fibrous tissue portions, and not
among the cellular elements.

Carcinoma appearing during pregnancy pursues a very rapid course.
Cases of this sort are cited by Gross, also by Paget, Henry, and Billroth.
In a case of my own the growth appeared two weeks after confinement, pre-
senting in many respects the appearance of inflammation, the whole breast
being dense and hard. It was, however, only slightly painful on pressure,
and upon removal it was found to be an alveolar carcinoma very rich in
cells and with but a small amount of connective tissue. The whole breast
was removed and the axilla cleared. Death followed, however, about four
months later, the patient complaining of excruciating pain in the region of
the liver, which was markedly enlarged, and also of pain in the lumbar
portion of the spine. Unfortunately, no post-mortem could be secured; but
the evidences of metastatic deposits were unquestionable.

Rapid progress of the disease is indicated by the softening of the tumor,
by the rapid infiltration of the whole breast, and also by the infiltration of
the infra- and supra-clavicular glands.

Gross says that the average time of the appearance of ulceration in
carcinoma is nineteen and nine-tenths months. Immobility on subjacent
tissues occurs on an average after twenty-nine and nine-tenths months.
Infection of the opposite breast occurred in 2.85 per cent. of cases. The

statistics of various observers as to the age at which carcinoma appears with the greatest frequency differ but little. Winiwarter found the age of greatest frequency to be from forty-one to forty-five years, Oldekopf from forty-six to fifty, the youngest being twenty-five years and the oldest seventy years. Oldekopf says that 53.7 per cent. appear during the period of menstrual activity ; 31 per cent. appear during the climacteric, or from the ages of forty-nine to fifty-eight ; 15.3 per cent. appear after the climacteric, or after the age of fifty-nine. The youngest patient observed by Poulsen was twenty and one-half years old ; the oldest was seventy-six ; the largest number were from forty to forty-four.

Lücke among one hundred and fifty-seven cases found the age of greatest frequency to be from forty-six to fifty years. Henry among one hundred and eighty-three cases found the greatest frequency to be from forty-six to fifty. Eichels among one hundred and fourteen cases found the greatest number to be between fifty-one and fifty-five. Gross among 1622 collected gives the age of greatest frequency as from forty to fifty ; the second period from fifty to sixty. Whereas 18.8 per cent. were during the age of greatest activity, or up to the age of forty, 81.2 per cent. were after that age, or during the period of functional decline. In 1545 women in whom the social condition was given, 85.5 per cent. were or had been married and 14.5 per cent. were single. Of 627 women mentioned, 66.5 per cent. were in excellent health, 20.57 per cent. were in moderate health. Among all these cases collated, Billroth's statistics show his patients to have averaged the youngest. In explanation of this fact, he states that most of his statistics were taken from operations performed upon Poles, Hungarians, and Jewesses, who develop, as a rule, younger than the inhabitants of Northern Europe.

As to the effect of age, Dennis says that the older the patient is, within certain limitations, the more malignant the carcinoma ; the nearer the gland is to a healthy functional activity, the less likely it is to assume malignancy.

The great frequency of cancer is shown by the statement of Dennis, that there were 1387 deaths from carcinoma of the breast in this country in the year 1880. Williams says that of eighty-six cases of cancer of the breast, forty-four were in women of dark complexion and forty-two in women of fair complexion. According to the statistics given by Billings, the deaths from cancer in 100,000 whites and blacks were 27.96 of whites and 12.17 of blacks. As to the proportion of carcinoma to other tumors, Billroth states that he had seen in all four hundred and forty tumors of the breast, and of these three hundred and seventy-five were carcinoma. Orth places carcinoma as forming eighty per cent. of all mammary tumors. As to the proportion in the right and left breast, Gross says that of 1664 cases the seat of tumor was 4.54 per cent. more common in the left than in the right breast, and of these it occurred in both breasts in two cases only. Its most common seat was in the upper and outer portion of the breast, or in 46.22 per cent. of cases ; its next most common seat was in the neighbor-

hood of the nipple, or 28.17 per cent. Oldekopf places the proportion of cases in the right and left breasts as six to five, being directly the opposite of the observations made by Gross. Dennis says that carcinoma occurs in both breasts in about five per cent. of all cases.

Pick says that recurrence of cancer in the opposite breast cannot be explained on the supposition that the cancer germs remaining have travelled from one breast to the other. He believes that both breasts must have been in a condition of cessation of function favorable to such changes. Terrillon says that he four times removed both breasts for carcinoma, but states that this is a very rare condition, and that the invasion of both breasts by tumor is usually a sign of benignity. The occurrence of carcinoma in both breasts is cited by Segay, Crawford, Nunn, and De Morgan. The location of carcinoma is placed by Dietrich as most common in the upper and outer quadrant, and next to this in the outer quadrant.

Various causes have been assigned for the production of carcinoma. In examining into trauma as a cause, Gross cites 1511 cases in which the trauma was assigned as a cause in 13.36 per cent., but in only about one-fourth of these was it shown that the carcinoma developed from the indurations following the injury. He says that the sole causes predisposing to carcinoma are age, irritation, and inheritance. Jonathan Hutchinson says that advanced age gives proclivity, local irritation excites, and subsequently hereditary transmission may perpetuate. Social condition and childbearing seem to have no influence. Dennis considers marriage as increasing the frequency of carcinoma, and traumatism as having some influence.

The question of lactation has also received extended consideration. Dietrich[1] among sixty-eight cases of carcinoma found that nineteen per cent. had nursed more than six children. On the other hand, twenty-eight per cent. did not nurse at all. Both he and Winiwarter conclude that the failure to nurse children, as well as the nursing of a large number of children, increases the liability to carcinoma.[2]

A comparison made by Dietrich of married and single women shows carcinoma to be relatively more frequent among the former. In speaking of these statistics, Billroth says that statistics do not show that childbearing favors carcinoma, though he does not criticise minute statistics on this subject. All that can be concluded concerning the subject is that the mamma, from the peculiar method of its development and periodical function, is especially liable to the growth of tumors. The statistics as to the influence of married and single life demonstrate little except that single women are not free from carcinoma.

Oldekopf and Dietrich consider mastitis a predisposing cause of cancer. The same they hold to be true of trauma, especially if it results in the extravasation of blood. On this point Gross cites one hundred and twenty

---

[1] Deut. Zeitsch. f. Chirurg., 1892, p. 472.
[2] Archiv f. Klin. Chirurg., 1879, p. 542.

cases of mastitis or abscess, in only forty-nine of which could it be demonstrated that the growth developed from the lump left from inflammation, and in only seven was the inflammation recent. These facts and the occurrence of carcinoma in sterile females render mastitis a doubtful cause. Billroth thinks that women who have had mastitis are more likely to have tumors in their breasts than those who have not.

As to the generalization of carcinoma, Billroth says it is probable that both the continuance and the separate points of cancerous infection result from a conveyance of cellular elements, but that this has not been anatomically established. It is only in the glands of the axilla, as a rule, that the same cancerous structure can be discovered as in the original growth. He thinks that the corpuscular elements of the small-cell infiltration possess the same power of infection as the epithelial cells, and when carried to other localities produce ulceration and inflammatory processes, without carrying with them epithelial cells.

Among the diagnostic signs of cancer, retraction of the nipple has been considered as classic. Not only may retraction occur at the nipple, but other portions of the integument may be similarly affected. Billroth says that when pain is present it should receive consideration, and discharge of a reddish-brown fluid from the nipple may occur not only with carcinoma, but with other tumors as well, and even without any tumor; so that it cannot be regarded as a positive sign of malignancy. Of the retraction of the nipple and dimpling of the skin, Gross says that they are important signs; but these must be distinguished from those cases in which the breast is pushed outward around the nipple, where the latter can be made to project again by pressure. Retraction of the nipple occurred in 52.17 per cent. of Gross's cases, and, since it occurs in only 5.22 per cent. of non-carcinomatous cases, it is a valuable sign. Out of two hundred and seven cases, Gross found discharge of a watery or bloody material in only fifteen cases.

A special cachexia has often been described as peculiar to carcinoma. Oldekopf (loc. cit.) does not believe that there is such a cachexia. Gross, among four hundred and seventeen cases in whom this point is noted, found that 66.55 per cent. were in excellent health, while only 20.57 per cent. were in indifferent or moderate health, and 12.92 per cent. were broken down from the disease. He says that scarcely one in twenty suffers in health previous to sixteen months after the detection of the disease. Billroth says that the appearance of the patient is of little significance: in the beginning she looks perfectly well; the cachexia comes later, with involvement of other organs and septic fever.

The metastatic deposits of carcinoma, as has been stated, occur more commonly through the lymph- than through the blood-channels, differing in this respect from sarcoma. Gross says that in one out of every seven cases this deposit may occur without infection of the lymph-glands. He further states that among seven hundred and twenty-eight patients metastatic de-

posits had formed, or were presumed to have formed, in two hundred and four cases, or 28.02 per cent. As indicated by section, they were present in fifty-one per cent of the cases.

Poulsen (*loc. cit.*) places frequency of metastatic deposits in the following order : 1, pleura ; 2, liver ; 3, lungs.

Speaking of metastatic deposits in the bodies of the vertebræ, Billroth says that they pursue a rapid course, being exceedingly painful, and thus different from caries. He says he knows of no condition causing so much suffering.

Snow states that thickening of the upper end of the humerus and sternum occurs not infrequently in carcinoma mammæ as a result of the disease. He says that the manubrium of the sternum is the most common seat of such involvement, and he thinks the condition would be more frequently observed if examinations were made for it.

Infection.—Infection in cases of carcinoma takes place by direct extension and through the circulation, it being most common through the lymph-channels, towards the axilla and the region below and above the clavicle. Orth says that infection may be carried to the anterior mediastinum. He says that infection of the internal viscera and bone probably takes place through the blood-current. The bones most often affected are the upper end of the humerus, the spinal column, and the upper extremity of the femur.

The growth of carcinoma often infiltrates the integument by direct extension, and may penetrate it, causing open ulceration. These points may become so generalized as to form an indurated mass over the entire front of the thorax, causing what is called cancer *en cuirasse.* It may project internally, involving the pectoralis major and ribs and even the pleura. As has been said, the lymph-vessels play an important part in the spreading of infection. According to Sappey, the lymph-vessels of the breast form two planes : first, a superficial or cutaneous, constituting a net-work which surrounds the breast and nipple ; second, a deep system of prodigious richness surrounding each of the lobes and lobules of the gland ; all the trunks of this net-work direct themselves from the surface and depth of the gland towards the nipple, where they form a plexus remarkable for the large size of the vessels which compose it. From this plexus surrounding the nipple, two, and sometimes three, large trunks direct themselves towards the glands of the axilla.

Heidenhain has written a very interesting paper upon the lymphatics of the breast, and in it cites the above quotation from Sappey, together with the investigations of Sorgius and Langhans. He says that these authors agree in the arrangement of the lymph-vessels, but that Langhans and himself hold that the deeper lymph-channels, instead of being directed towards the nipple, are directed posteriorly, accompanying the veins along the fascia covering the pectoralis major.

He holds that the infection is transmitted by means of the carrying of

infected cells along the lymph-channels, and that this is the only means of explaining the distribution of cancerous cells to considerable distances. He further says that in the extremities and in the penis returns of malignant disease are usually in the next-lying glands, and there is no evidence of disease of the lymph-channels lying between them. In the breast this does not seem to be true. This, perhaps, is due to the fact that the channels are not direct, but are bent.

Speaking of infection, Poulsen says that the time when carcinoma becomes adherent to the skin and the pectoralis major varies widely with the character of the growth and the individual case. Oldekopf says that movable carcinoma infects more early the axillary glands, while if fixed to the pectoralis major the glands are infected later. The movable form infects the glands in from twelve to sixteen months; fixed carcinoma in from thirteen to twenty-six months. The conclusions reached by Heidenhain[1] are,—First, the pectoralis fascia is very thin, especially in fat women, and is difficult to separate from the muscle without removing the muscle or portions of it. Second, the mamma of thin women lies directly on the muscle, and in fat women small lobes are similarly situated, so that in amputating above the fascia, portions of the mamma are easily left behind. Third, every breast in which there is a carcinomatous nodule is diseased to a wide extent, perhaps throughout, the epithelium of the acini becoming proliferated with an accompanying pernicious growth of connective tissue, and recurrent foci are perhaps due to the proliferating acini which remain behind in the wound. Fourth, in the retro-mammary fat there are usually accompanying blood-vessels from the glands to the lymph-channels in the fascia; in two-thirds of the cases of carcinoma of the breast there are small microscopic metastases in these lymph-channels; the epithelial growth extends rapidly through these pre-existing channels, even through thick layers of fat, down to the fascia. Fifth, the pectoralis major is, as a rule, undiseased so long as the carcinoma is freely movable upon it; it is diseased first when a metastatic nodule of the fascia grows into the muscle, or when the primary disease, through continuous growth, attaches itself to the muscle. Probably the cancer itself extends into the lymph-channels of the muscle and forces its way from these between the muscle-fibres. Sixth, probably by contractions of the muscle the epithelial cells are pushed with the lymph-stream into the muscle. A cancerous muscle seems in its entire extent to be suspicious.

Volkmann was the first to point out the necessity of removing the fascia covering the pectoralis major, in order to escape recurrence of the disease. Heidenhain says that he is convinced that carcinomata which have reached the lymph-channels—and this is true of the majority of cases—have already reached the surface of the pectoralis major independent of the thickness of the fat. He also pointed out that the muscle itself remained for a long

---

[1] Deut. Gesell. f. Chir., 1889, p. 58.

time unaffected, and it is his belief that the lymph-passages above the pectoralis major run parallel to it, but not into the muscle. He says that from physiological and pathological investigations we may conclude that the muscle remains sound as long as the carcinoma has not grown fast to and into it. He collected sixty-five cases of carcinoma adherent to muscle, the cases being those of Volkmann, Küster, and Helfreich. Among these were only two positive cures, seven relative cures, and fifty-six deaths. He concludes that the attachment of the tumor to the pectoralis major renders the prognosis very bad. Six of the relative cures lasted from one-half to one and three-fourths years. One died after two and one-half years, probably from metastasis. He also thinks that recurrences of carcinoma in the skin from portions remaining behind in it are rare. These secondary infections of the skin he thinks arise from portions of the growth remaining in the deeper tissues.

Axillary Glands.—The question of enlargement of the axillary glands, in its relation to carcinoma mammæ, is one which has attracted attention for many years, but its true importance has not been so long recognized. Formerly it was common to advise that operations for carcinoma mammæ should be deferred until all the symptoms belonging to the disease had made themselves clear, such as retraction of the nipple, involvement of the skin, and perhaps enlargement of the axillary glands. If the glands of the axilla were not found to be enlarged, even at a later date, the breast was removed without attention being paid to them; whereas more recently the opinion has rapidly gained credence that in a large majority of cases the axillary glands are involved and demand removal as imperatively as the breast itself. This method was first insisted upon as one universally to be followed by Küster. In 1883, and from time to time thereafter, he made statements as to the large proportion of cases in which the axillary glands were found to be infected after operation, even though they could not be felt before. In 1887 he stated that in operations upon one hundred and sixty-three cases of carcinoma mammæ he found enlarged axillary glands one hundred and fifty-eight times, or in 97 per cent of his cases. Before operation they could be felt in one hundred and seventeen cases, or 71.77 per cent.; in forty-three cases, or 26.25 per cent., they could not be felt before operation, and still they were found at the operation. Rotter, reporting the cases of Von Bergmann's clinic, cites one hundred and fourteen cases operated upon, the axillary glands being found to be involved in all but two cases. Speaking of supra-clavicular glands, Billroth says that while they may be indistinctly observed before operation, after the removal of the breast and axillary glands they may at first enlarge, and later, through fatty degeneration, contract and almost wholly disappear. The infection of the axillary glands follows the beginning of the disease in from fourteen to eighteen months, taking place a little earlier when the primary growth is in the upper and outer quadrant of the breast.

Gross cites one hundred and ninety-two cases of local dissemination noted by Török and Wellalshöps. There was invasion of the glands in 52.6 per cent. and metastasis in 72.9 per cent. Of one hundred and seventy-four cases free from local infection, the glands were affected in 42.5 per cent. and there were metastases in 45.4 per cent. These statistics are from a record of three hundred and sixty-six post-mortem examinations. One-half of the cases had been operated upon. He says that the seat of tumor does not seem to influence the time of the involvement of the axillary glands. Heidenhain quotes Küster as saying that among ninety-five cases of recurrence he saw but one recurrence in the axilla. Gross says recurrences in the axillary glands are more frequent by twenty-seven per cent. in cases in which they were not removed than in those in which they were removed at the same time with the breast. Oldekopf says that in cases requiring extirpation of the axillary glands the patients live less time than those in whom the glands cannot be felt before operation. It must be remembered, however, that the former cases are those of long continuance. Poulsen cites thirteen cases of carcinoma of from one month's to five years' standing, in which the patients died with recurrence in the axilla, no enlarged axillary glands being felt before operation, and hence the axilla not being opened. He also cites twenty-four cases of a similar sort in which the breast was removed and the axilla was not opened. Of these twenty-four cases, twenty were living and free from recurrence for periods varying from five to thirteen and one-half years. Two died of phthisis after four and five and one-half years, showing no signs of recurrence. He records twenty other cases in which recurrence took place in the axillary glands; in all, the return was during the first year. In one-half of these cases the axilla had not been cleared, because the glands could not be felt to be enlarged. His conclusion is that the axilla should always be cleared.

As to the time existing before operation, Gross records one hundred and forty-six cases in which the history of the operation could be followed. The average time of the existence of the disease before operation was thirteen and three-tenths months; the average time of cure was five years and nine months. Dietrich, writing upon this point, says that in the cases which he reports the disease had existed seventeen and two-tenths months before operation. He cites also the cases reported by Schmidt from Küster's clinic, to the effect that while from 1872 to 1880 64 per cent. of cases had existed one year before operation, during the last ten years only 35.5 per cent. had existed over one year.

Kortweg,[1] in comparing the statistics gathered from Winiwarter, Oldekopf, Sprengel, Hildebrand, and Küster,—three hundred and twenty-two cases in all,—in which the length of time before operation and the length of life after the operation were recorded, says the tables show that the longer the time during which a tumor existed before operation the longer the

---

[1] Deut. Zeitsch. f. Chir., 1892, p 480.

patient lived afterward. He concludes from this that the more malignant tumors, through pain and rapid growth, etc., attract attention and come earlier to operation, while the less malignant ones are operated upon later. He believes that some tumors are relatively much more malignant than others, and that in such cases one should be more conservative about operation.

The various opinions which have existed and still exist concerning the curability of carcinoma by operation are very interesting, and may perhaps be explained by the different operative procedures which have been in vogue. The old method was simply to extirpate the malignant nodule from the breast, taking but a small amount of additional tissue and leaving the axilla unopened. If we can trust statistics, the more radical methods now in vogue produce far better results, and it is perhaps due to this difference of method that the different opinions held by able men have come to exist. In this connection it will be of interest to cite the opinions held by eminent surgeons unfavorable to operation.

First among them we shall quote Paget,[1] who says, " In deciding for or against the removal of a cancerous breast in any single case, we may dismiss all hope that the operation will be a final remedy for the disease. I will not say that such a thing is impossible, but it is so highly improbable that the hope of its occurrence in any single case cannot be reasonably entertained." He further says, " I am not aware of a single clear instance of recovery,—that is, with a patient who lived for more than ten years free from the disease or with the disease stationary."

Hodges,[2] a man of wide experience and an acute observer, says, " I have never known but one instance of seemingly prolonged life after removal of cancer of the breast. I cannot expunge the belief that patients with cancer of the breast are, as a rule, better off without than with an operation, or that their cure, if cured they are to be, lies in some as yet undiscovered remedial measure of coming surgery rather than in extending a mutilation which, whether limited or comprehensive, must always remain *immedicabile vulnus*."

On the other hand, the statistics of many able surgeons must be taken as proof that carcinoma can be cured by operation. Dennis says that the returns three years after removal amount to scarcely two per cent. The celebrated dictum of Volkmann[3] is, that when an entire year has passed after the operation and no symptoms of local recurrence, enlarged glands, or infection of the viscera can be found on the most careful examination, one may begin to hope that a permanent result has been reached. After two years the result is commonly permanent, and after three years it is almost sure to be so.

Billroth, after citing this opinion of Volkmann, says that if after one

---

[1] Paget's Pathology, London, 1876, p. 657.

[2] Boston Medical and Surgical Journal, November, 1888, p. 523.

[3] Volkmann's Beiträge zur Chirurgie, Leipsic, 1875, p. 325.

year a thoroughly experienced surgeon can find absolutely no sign of recurrence of disease, the patient may be looked upon as cured.

Oldekopf (*loc. cit.*) says that recurrences are rare after three years.

As to the length of life of patients with and without operation the following table is given by Dietrich:

	No Operation (Months).	Operation (Months).
Winiwarter	32.9	39.3
Henry	26	39.6
Fink	20 5	27.4
Sprengel	27 (?)	34.7
Oldekopf	22.6	38.1
Schmidt.	(?)	32.4
Lücke	24	31.2

It will thus be seen that, so far as we can judge from statistics, operation markedly increased length of life. It must be remembered, however, that the patients who were not operated upon may have been refused operation because of their hopeless condition when observed, and hence the table may not properly represent the length of life under the two conditions.

Gross cites one hundred and seventeen patients dying without operation, with an average length of life of 28.6 months. Of six hundred and sixty-five dying after operation, with recurrence demonstrated or suspected, the average length of life was 38.5 months. Poulsen says that the average length of life for operated cases was 4 years, and for unoperated cases 5.9 years. Omitting cases of slowly growing cancer existing from ten to forty years, the length of life was, for cases operated upon 3.4 years, for cases not operated upon 2.3 years. These represent two hundred cases operated upon and fifty in which no operation was done. Dietrich cites Lücke as saying that cancer can undoubtedly be cured. The prognosis depends upon: 1, early operation; 2, radical removal. Dennis says the earlier the disease can be detected, the better the prognosis as regards recurrence. If a tumor can be radically removed within six months from its incipiency, and the axilla can be thoroughly cleared, the prognosis will yield brilliant results not before realized. Kortweg, notwithstanding his unfavorable opinion concerning the results of operation, advocates the early and complete removal of tumors and glands, as promising more than anything else in good cases and as being the only chance in bad cases.

Dowd[1] cites cases in which carcinoma and sarcoma were developed after many years from what seemed to be benign growths. Similar cases are reported by Oldekopf, Hutchinson, and Pompinel. I have recently had an opportunity of observing such a case in a woman sixty-four years of age. With her second and last lactation, at the age of thirty-one years, she observed a small nodule in the right breast, which remained quiescent

---

[1] New York Medical Record, April, 1892, p. 436.

until within six months, when it began to enlarge with considerable rapidity. A few days ago I found on examination that the lump had attained a diameter of about two inches, with unmistakable evidences of malignancy, and that the axillary glands were extensively enlarged.

Recurrences.—Recurrences may occur either in the axilla or in the internal viscera. Schmidt gives statistics concerning ninety-five patients observed by Küster, all of whom died with recurrence. Fifty-nine had local recurrences in the scar, skin, muscle, or carcinoma *en cuirasse.*

Of thirty-four recurrences recorded by Rotter, thirty were in the region of the mamma, twelve were complicated later by growths in the supra- and infra-clavicular regions, and in six cases these pushed downward into the axilla. Six recurred in the other breast. Only one had involvement of the axilla alone. Of one hundred and seven cases which he reports as surviving the operation, thirty-four were cured.

Gross collected one thousand and thirty-six cases operated upon, having local reproductions in 66.86 per cent. Recurrence took place in 44.14 per cent. in three months. After one year there were but 15.5 per cent. of recurrences, and after three years there were only 2.32 per cent. Dennis estimates the recurrence of cancer after extirpation as about 75 per cent. of all cases. Poulsen, reporting two hundred and seventy-five patients, says that in one hundred and seventy-four, or in 63 per cent., there was local recurrence. In sixty-eight cases the recurrent growths were extirpated, but in only five of these did there remain immunity from recurrence for three years. In the other cases there was renewed recurrence or the patient died within a short time; 80 per cent. of all recurrences were within the first year. Oldekopf says 46.4 per cent. of recurrences are within three months; after one year only 16 per cent. take place. Küster reports one case of recurrence five years after operation.

In speaking of his cures, Dennis says, " In my list of cases permanently cured all were under fifty excepting one; in all cases in which there was return followed by death the patients were over fifty years." He concludes that there is less malignancy in carcinoma affecting the breast in the early stages of obsolescence of the gland tissue than when the gland has fully completed its degenerative changes. He suggests that the irritation of the cicatrix remaining after the removal of a carcinoma may be a potent factor in causing recurrence, since the recurrent nodules are found near the cicatrix. Consequently, he advises that the cicatrix be carefully protected from irritation.

Rieffel,[1] assistant of Tillaux, speaking of recurrent disease, concludes, " It is caused, first, by imperfect removal of the gland, prolongations of the disease having escaped the operator's notice; second, even if the entire gland has been removed, infection has gone beyond the limits of the gland, either in subcutaneous cellular tissue, the skin, or pectoralis major. Fre-

---

[1] Thèse de Henri Rieffel, Paris, 1890.

quent recurrences of growth in this neighborhood suggest the possibility of their seat being in the pre-muscular tissue." He says that nothing is understood of the late recurrence of the disease.

Terrillon concludes that recurrence seems to be the rule with extirpation of the breast when the axillary glands are involved. Recurrence is most common in early years, and patients do not survive more than six or seven years. He reports from 1880 to 1890 one hundred extirpations of the breast, and concludes that tumors with infected axillary glands have a malignancy almost fatal.

Dennis reports seventy-one cases of tumor of the breast operated upon, with only one death, which occurred in a patient with hæmophilia. Among these were thirty-three pure carcinomata; in two the result was unknown. Of the remaining thirty-one cases, eight, or a little more than 25 per cent., were living after three years. Besides these, there were a number approaching the three-year limit, so that he estimates his cures at about 30 per cent. Gross, uniting his own cases with those of Banks, places the percentage of permanent cures at 20.86. Among Gross's own cases he found the axillary glands involved in 87.5 per cent. Among forty-three operated on by Gross and ten by his colleagues in the same hospital, there was a mortality of 3.7 per cent.

Poulsen says, of two hundred and forty-two operations, twenty-two per cent., or fifty-five cases, lived free from recurrence for three years or more. Of these fifty-five cases, five were without microscopic examination. Of fifty patients living and free from recurrence from three to fifteen and one-half years, there were six that later had recurrence,—namely, in three, three and one-half, four and three-fourths, six, and nine years after operation,—and five cases had died. Of these operations, some were for amputation of the tumor or breast alone and some were connected with clearing of the axilla.

Butlin says, " I am confident that we may regard operations for the removal of mammary cancer as successful in effecting a complete cure in rather more than ten per cent. of all cases treated. I believe that a percentage of twelve to fifteen is nearer true." From a consideration of the more modern statistics, it seems probable that with the awakening of the profession to the necessity of the early recognition and removal of carcinoma mammæ, results heretofore unexpected may be attained, and that instead of ten per cent. of cures after extirpation, even thirty to forty per cent. may be realized.

Paget's Disease.[1]—In 1874, Paget[2] described a condition of the breast characterized at first by eczema and later by carcinoma. To this has been given his name. The disease is described by Wickham[3] as one which always begins in the nipple with small crusts, which form repeatedly upon it. This condition may continue for years. After a time ulceration takes

---

[1] See chapter on Cutaneous Diseases.
[2] St. Barthol. Hosp. Rep., 1874.
[3] Thesis on Paget's Disease, London, 1890, p 232.

place and gradually extends into the tissues beyond the nipple. This has been described as occurring in concentric rings about the nipple and areola. The nipple gradually becomes retracted. The rapidity with which the cancerous condition of the breast appears after the ulceration varies widely. It has been described as occurring within a year or two, and in other cases as not occurring until after years, even up to fifteen or twenty. Barling describes a case of this sort, beginning in an intractable eczema lasting during six months and accompanied by suspicious nodules of the breast. The nipple showed an abraded surface, but no ulcer. Running inward from the nipple was an indurated cord one and one-half inches in length, ending in a nodule the size of a bean. On removal, this enlargement was shown to be a carcinoma.

The effect of coccidia or psorosperms has been extensively studied in connection with this disease. Among those who have called attention to this condition are Darier, Hutchinson, and others. J. Hutchinson, Jr., presented before the London Chirurgical Society specimens of eczema of the breast illustrating various appearances in the surface epithelium, which he believed to confirm Darier's statement that coccidia or psorosperms are to be found in these conditions, sometimes in great numbers. He says that these appearances have not been found in cases of eczema other than the chronic condition known as Paget's disease, neither are they found in all supposed cases of the latter. He observed them in three out of five cases. Duret considers the coccidia to be the cause of the eczema which results in epithelioma. Orth says that the eczema of Paget's disease is supposed to be due to a round parasite. Oldekopf, among his series of cases, cites only one of carcinoma with eczema. Bowlby reports five cases; in two there was eczema of the nipple without tumor, and this went to show that the disease of the nipple might precede disease of the breast. On the other hand, Thin holds the disease to be malignant dermatitis of the epithelium, affecting the mouths of the milk-ducts, and believes the eczema to be secondary rather than primary. Delbet says that the coccidia are not proved to be the cause of Paget's disease. The psorosperm has been studied, especially in rabbits, by Malassez, and these germs are held to be the cause of malignant disease by Darier, Albarran, Wickham, Hutchinson, and O'Neil, especially in Paget's disease. Delbet says that other interpretations of the disease have been given by Cornil, Faber, Domergue, and others. He questions, however, whether there is any such disease, and whether the two conditions—cancer and eczema—may not be coincident. Wickham advises immediate operation as soon as diagnosis is made. Delbet says that one should wait until the cancer is fully developed, since it may never appear.

Villous-Duct Cancer and Tubular Cancer.—Under these heads are described forms of growth which by some are considered identical and by others as separate conditions. In speaking of these, Orth says that there are developments of cysts containing villous growths which may be slight

or may entirely fill the cyst. The cyst-wall is smooth, and is probably a dilated duct. The villous growths are probably carcinomatous, being due to the development of carcinoma in the wall of a duct, and its subsequent distention. It is possible that the disease described by Reclus, and in some instances followed by carcinoma, may be developed in this manner.

Williams speaks of growths which he describes as "tubular cancers," being conditions which are relatively rare, and says that they are associated with cysts and intra-cystic papillary growths. He questions if they may not be the later development of a villous-duct cancer of many years' standing. He says that from the columnar type of cells and the tubular form assumed by the ingrowths it may be inferred that the growths originate from the mammary ducts. The growths are usually nodular, and the nipple is not retracted nor is the skin involved. He uses the term "tubular" in a different sense from that used by Billroth. Cases have also been described by Shattuck, and one has been described by Butlin. Williams says that the youngest patients are forty and the oldest sixty-five and one-half years; the average age of eighteen cases was fifty-three and one-half years. Williams advises the amputation of the breast exactly as in scirrhous diseases, but the axilla need not be cleared unless absolutely involved, since this variety of cancer is more limited than scirrhus. Williams considers villous-duct cancer identical with Billroth's tubular cysto-adenoma, Gross's true adenoma, and Cornil and Ranvier's *carcinome villeux*. He says that it is composed of a slender framework of fibrous tissue lined by one or more layers of columnar epithelium. It is a perfectly innocent growth, though often multiple, has no tendency to local infection, does not become disseminated into adjacent lymph-glands or into the system at large, and when completely removed never recurs. Villous papillomata develop later than fibro-adenomata and carcinomata, and are most liable to be confounded with scirrhus or sarcoma. When the disease is diffused the whole gland must be removed.

Routier says that if the breast is not attacked throughout by nodules, but only in places here and there a prominent point appears, and if, above all, there is a discharge of blood by the nipple, the diagnosis is *épithéliome dendritique*. There can be no doubt as to the diagnosis, provided that the skin is adherent, the axillary glands are involved, and the nipple is retracted. As to prognosis, if one operates upon a true cyst, the cure is permanent. The prognosis after the removal of an *épithéliome dendritique* is doubtful, the danger being the same as after the removal of cancer, although such growths are to be placed among the least malignant.

Robinson describes, under the head of duct papillomata, what Bowlby calls duct cancer. The name applied by Cornil and Ranvier is *carcinome villeux*. Dubet calls them *épithéliome dendritique*. Labbé and Coÿne call them *épithéliome intra-canaliculaire*. Bowlby[1] cites a case with two recur-

---

[1] Lancet, London, vol. i., 1892, p. 860.

rences, Butlin[1] a case with five, while Robinson reports one. The latter states that duct adenomata and carcinomata are associated with duct cysts. These are growths appearing in dilated milk-ducts, and not filling them as do duct papillomata; they may be sessile or villous forms and extend into the cyst. He says that this pedunculated duct adenoma may be multiple, and the prognosis seems to be favorable. The malignant disease may be implanted on the duct cysts. With its advent there may be pain and retraction of the nipple and the skin becomes involved. The disease progresses more slowly than scirrhus, and the glands are not so frequently involved. He suggests exploratory incision. If the growth is pedunculated, local removal may suffice; if it is nodular, total removal is indicated. He thinks that there is a similarity between duct carcinoma and Paget's disease, and details one case in which the same forms were present in the epithelium that were described by Darier and Wickham as coccidia in Paget's disease. Bowlby[2] reports twenty-one cases of duct cancer, thirteen of which were his own and eight belonged to other surgeons. There were four patients under forty years of age, five between forty and fifty, eight between fifty and sixty, and three between sixty and seventy. In ten of his own cases blood-stained fluid exuded from the nipple, and this was noted also in some of the others. The nipple and areola were not affected, the growths were close to the nipple, and the axillary glands were not involved. In three cases there was return after removal. No case had proved fatal up to the time of writing; one patient had remained well nine years, and others six, five, and four years. The growths are sometimes multiple in the same breast; they are firm and elastic or else knotted to the touch, not hard and nodular like scirrhus. On section, they are found to be encysted, soft and friable, and blood-stained. A portion of the villous growth may even protrude through a dilated nipple. Although the tumors may recur locally, they are not so prone to do so, or to affect the glands, as is scirrhus. They are classed as carcinomata, since they grow from the epithelium of the ducts and infiltrate the tissues around them. They occur, as a rule, in women older than those with sarcoma, and do not grow so rapidly as sarcoma. Their treatment is extirpation.

Diagnosis.—The diagnosis of the various diseases of the breast is often made with great difficulty, but there are signs which are of importance and which may lead to the establishment of the proper conclusion.

Speaking of carcinoma, Gross says that pain occurred in 88 per cent. of all cases. In a series of 1414 cases in which the facts were noted, there were adhesion and discoloration of the skin in 10.44 per cent. of the cases and ulceration in 23.9 per cent. The average time at which infection of the skin takes place is 15.8 months. As to the diagnosis of carcinoma, Billroth says that an error can occur after careful investigation, in mis-

---

[1] St. Barth. Hosp. Rep , vol. xxiv.
[2] Lancet, London, June, 1893, p. 1369.

taking a deep cyst for a carcinoma, and that it is far better in such cases to operate than to fail to remove a carcinoma, since even the cyst may be carcinomatous. He also says that a solid tumor developing in the breast of a woman over thirty-five years of age, which continues to increase in size, is usually carcinoma.

As to the diagnosis of tumors in general, the same author says that from the age of puberty to thirty or thirty-five years, movable, painless, and rounded tumors growing slowly may be inflammatory due to injury, or fibroids. If the former, they will disappear or develop abscess; if they continue to grow slowly and then remain hard and nodular, perhaps turgescent and slightly painful at menstruation, they are fibromata. If they grow slowly and constantly, they are adenomata, adeno-sarcomata, or cysto-sarcomata. Large cysto-sarcomata are most common from twenty-five to thirty-five, and may reach an enormous size and be followed by recurrences. Rapidly growing soft tumors (which in the beginning may be confounded with abscess) in young women are usually medullary sarcomata. Cysts, when deep or small, are difficult to diagnosticate; if superficial, they are easy. The majority of tumors occurring from twenty to thirty years of age are fibromata; from thirty to forty, cysto-sarcomata; from forty to fifty, carcinomata. Dr. Welch, in a verbal communication, told me that he had frequently examined growths of the breast supposed to be benign and had found them to be malignant.

Gross says that errors may be made in the diagnosis of cases with a retracted nipple, since an abscess may be present rather than a carcinoma. In a case of my own there were stony hardness and a retracted nipple, the growth presenting marked resemblance to a scirrhus. No suggestion of fluctuation was present. On incision, however, it proved to be a collection of pus, although there had been no symptoms pointing to such a condition.

Treatment of Cancer.—It is unnecessary to go into the history of the treatment of cancer. Innumerable methods have been proposed. Medication thus far has proved of no service. There still remain three methods of treatment: first, inoculation by erysipelas; second, removal by the cautery or by caustics; third, extirpation. The first and second methods demand a few words.

Treatment by Inoculation with Erysipelas.—Treatment by inoculation with erysipelas has of late attracted some attention. An interesting report upon this subject has been made by Coley (*loc. cit.*), who has collected twenty-three cases of malignant disease accidentally inoculated by erysipelas and fifteen cases intentionally inoculated. Of these, seventeen were carcinomata, seventeen were sarcomata, and four were either one or the other. Of the cases of carcinoma, three patients were permanently cured, ten were improved, with undoubted lengthening of life, and one died on the fourth day. Of the seventeen cases of sarcoma, seven patients were permanently cured, the remaining, save one, showed more or less improvement, and one died with erysipelas. Of two cases of sarcoma treated by the toxine of

erysipelas, kindly furnished me by Dr. Coley, one was a melanotic sarcoma, and could not be kept sufficiently long under treatment to allow of any conclusion being reached.   The other case—a large sarcoma of the thigh— is still under treatment, and the growth of the tumor has been markedly retarded.   Coley's conclusions are that the curative effect of erysipelas on malignant tumors is an established fact; that it acts more powerfully on sarcoma than on carcinoma; that the curative action is systemic, and is due to toxic products of the streptococcus.   His belief in the parasitic origin of malignant disease has already been stated.

Caustics.—Butlin (*op. cit.*) cites a record of one hundred and sixty-two cases of carcinoma treated by Bougard, in which the glands of the axilla were already involved.   According to Bougard's statement, these operations were performed without a single death, and he claims a larger percentage of cures than that obtained by extirpation.   For the purpose he uses a paste made of

Wheat flour	60 grammes.
Starch	60 "
Arsenic	1 gramme.
Cinnabar	5 grammes.
Sal ammoniac	5 "
Corrosive sublimate	0.50 gramme.
Solution of chloride of zinc (52 per cent.)	245 grammes.

Butlin, after a study of the work of Bougard, considers it sufficiently successful to require notice, but still holds to the opinion that extirpation is the preferable method.

To avoid the dangers which formerly attended the extirpation of tumors by the knife, on account of infection, various methods have been devised. Gosselin reports, out of one hundred cases operated upon by the knife, thirty-eight deaths, while in one hundred cases operated upon by caustic arrows (*flèches*) his mortality was only five per cent.   With the knife, he says, erysipelas occurred in forty-six out of one hundred cases.   Labbé and Coÿne[1] cite the experience of Velpeau, who, after operation with the knife, had erysipelas in forty out of one hundred cases, and fourteen out of one hundred died.   His mortality with caustics was nine out of one hundred.   With the advent of aseptic surgery all this has been changed, so that the danger of erysipelas has been entirely overcome.

In this connection, Billroth says that all treatment with salves, by pressure, etc., should be abandoned.   The reasons for the abandonment of caustics are evident, since with the advent of aseptic surgery the risk is less with the knife than with caustics, there is no pain, a definite amount of tissue can be removed, and regions in which caustics would cause serious danger can be invaded by the knife with safety.   We may say that the time for the removal of carcinoma mammæ by the use of caustics

---

[1] Traité des Tumeurs bénignes du Sein.

has passed. The injection of inoperable malignant growths with a 1 to 200 aqueous solution of pyoktanin has been largely tried, having been introduced by Mosetig-Moorhof, of Vienna. Though seemingly retarding the progress of some cases, it has been of little permanent benefit.

Extirpation.—We now come to consider the treatment of carcinoma by extirpation. The method formerly employed has already been described, —namely, the simple removal of the tumor,—and to its prevalence is to be ascribed the failure which has attended it. To the more thorough method followed by modern operators is unquestionably due their greater success. It is only fair, however, to say that this success has been made possible less, perhaps, by greater operative skill than by the development of modern surgery. Certain cases present themselves in which positive diagnosis is impossible. Unfortunately, it is still far too common, under such circumstances, to wait until the advent of classic signs, such as retraction of the nipple, ulceration of the skin, and involvement of the axillary glands, before undertaking operation.

In this connection, Schmidt, assistant to Küster, suggests that in case of doubt an exploratory incision should be made. If the growth is malignant, it should be excised ; if it is doubtful, a piece is rapidly placed under the microscope, and if it proves to be malignant it is extirpated. If the growth is thought to be benign, it is enucleated, and is submitted to microscopical examination, and if shown to be malignant is extirpated twenty-four hours later. In the same connection, Poulsen says that every case of tumor of the breast, whether malignant or not, should be extirpated as soon as possible, even if not larger than a hazel-nut, and examined microscopically. If found to be malignant, the radical operation of removing the entire breast and clearing the axilla should be performed. He suggests that the exploratory operation should be made under cocaine. Considerable difference of opinion formerly existed as to whether, in operations upon tumors of the breast, the removal should be partial or entire. Of recent years perhaps the most prominent advocate of partial removal is Butlin (*op. cit.*), who favors it in suitable cases, holding this plan to be as successful as complete operation. He has gathered extensive statistics upon this point. The weight of opinion is, however, strongly in favor of extirpation of the entire breast.

Several extracts from Billroth cannot fail to be of interest in this connection on account of the wide experience and the unquestioned ability of this great surgeon. One cannot read his work upon diseases of the breast without being impressed by the breadth of his knowledge and the candor of his statements. He says that the sooner the diagnosis is positive and is followed by treatment the better. He lays down the principle that every tumor of the breast which continues to grow should be extirpated. He recommends the immediate removal of carcinoma, so long as this is possible without imminent danger to life, since extirpation of the tumor and axillary glands undoubtedly delays the disease. He advises the removal

of growths recurring in the scar or in the axilla.   While advocating total extirpation, he says he is not able to prove from his own statistics that partial extirpation is followed by earlier recurrence than total, and he believes that solid tumors which are not growing (fibromata) and scirrhus in old women may be let alone; still, there is seldom reason to refuse such patients operation, if desired.   As to benign tumors, their removal is desirable, since as years advance they may increase and become malignant. There are many observations to prove that tumors quiescent for years and seemingly benign may later become malignant; besides, a tumor in the breast has a depressing influence on many women.

In the same connection, Waldeyer says, " Partial extirpation of cancerous organs is entirely useless.   In cancer of the breast one should remove the entire gland, even though it seems for the most part intact. Here conservative surgery is entirely out of place.   It cannot arouse any opposition when I hold that a partial removal of the organs infected with cancer is wholly useless; in fact, it is a dangerous procedure.   Thus, one ought never to make a partial amputation of the breast when infected with cancer, but should always remove the entire gland, even though it seems to be not generally diseased."

Heidenhain, after a careful study of carcinoma, says, " I am thoroughly convinced that every cancerous breast is altered through its entire structure. Everywhere and widely distant from the chief seat of the disease one finds the epithelium in the acini increased in size and the lumen of the acini largely absent."   Not only the entire breast, but the glands, with the afferent and the efferent vessels, are involved and should be removed.

The removal of the axillary glands is not so modern a method as has been supposed.   Billroth states that it was performed by Fabricius ab Aquapendente and Fabry von Hilden, and the method was further developed by J. L. Petit.   Whether it should or should not be performed is still a matter of discussion.   Butlin, in discussing the subject, cites one hundred and forty-one cases in which the breast alone was amputated, and one hundred and seventy in which it was amputated together with the glands of the axilla.   In the three hundred and eleven cases there were fifty-one deaths : thirty-nine were after the operation in which the axilla was opened, and twelve were after simple amputation of the breast.   The deaths from the larger operation were about twice as numerous as those from the smaller.   He says that it is better to remove the enlarged axillary glands by drawing them out separately or two or three at a time with the fingers, even tearing them out of the fat in which they lie, than to use the knife freely, on account of the proximity of the large vessels and nerves. If distinct cords can be felt running up into the axilla or directly to the glands, they should certainly be removed, and with them the fat and connective tissue in which they lie; but if there are no distinct cords, it is not necessary to search for the line of the lymphatic vessels or to remove a large amount of fat.

Pick[1] does not believe in dissection of the axilla in every case of malignant disease, first, because recurrence takes place in a large majority of cases in the original scar instead of in the axilla, and clearing the axilla adds materially to the mortality of the operation. He estimates this increased mortality at ten per cent. He advises an incision in the axilla and the insertion of the finger to determine the presence or absence of enlarged glands; if these are found, he advises extirpation.

Terrillon[2] says, "I am strongly of the opinion that one should not remove the glands of the axilla unless they are manifestly involved." "It is usually possible to feel them, even in a fleshy woman, upon the border of the pectoralis major on comparison with the other side, and, failing to find these, one may find indurated tissue as characteristic as the glands themselves." On the same subject, Ashhurst (*loc. cit.*) says, "Unless I find glandular enlargement, I prefer not to open the axilla." Bryant in ordinary cases would open and clear the axilla, but does not do this in feeble or in aged women with ulcerating cancers. He does not open the axilla unless enlarged glands are felt, and he states that in atrophic forms of cancer in people advanced in years he is opposed to operation, since the progress of the disease is usually slow when let alone, whereas when operated upon the process seems to be rendered more active and the disease speedily recurs.

As opposed to the opinions already stated, we record an interesting extract from the work of Volkmann, which is as follows : "One scarcely trusts his eyes when he reads in a recent work on operations that to remove the axillary glands one should lay bare the glands one by one, split the capsule, and shell out the glands without the loss of blood. Whoever operates in this way had better once and forever restrain his hand from carcinoma."

Terrillon[3] says that malignant and mixed tumors should be extirpated and the enlarged axillary glands removed, if they exist. Recurrent growths should be removed when possible. Banks[4] deems the old incomplete operation unscientific and useless; by the complete operation life is prolonged and recurrences are less common. He does not hesitate to tie or remove portions of the axillary vein, if necessary. Johnston,[5] after examining a large number of amputated breasts, concludes that the entire breast, all overlying skin, and the surface of the pectoralis muscle should be removed. Deaver's[6] method is first to clear the axilla, believing that in this way there is less liability of infection of the tissues of the armpit. He favors the clearing of the axilla in all cases, and says that the dissection, if properly made, does not injure the nerves contained in the

[1] Clinical Journal, London, May 31, 1893.
[2] Bull. de Thérapeutique, Paris, 1891, p. 385.
[3] Loc. cit.
[4] Lancet, London, March, 1887, p. 627.
[5] Ibid., January, 1892, p. 89.
[6] International Clinics, Philadelphia, July, 1891, p. 131.

space and is not followed by impairment of motion such as has been supposed.

Stiles[1] concludes thus : " The principle which should underlie all operations for carcinoma of the mamma should be the complete removal, not only of the tumor and the breast, but also of as much of the surrounding tissues as are likely to contain lymphatic spaces and highways along which the malignant elements of the disease had been disseminated." Dietrich,[2] in a record of ninety-eight cases of carcinoma of the breast, states that in all, except two, not only the entire breast was removed, but the axilla was cleared. In one of the two cases the growth had been observed only two months and the other was characterized by a cyst-formation. One of these patients is still living after eight and the other after five and one-half years. Watson Cheyne,[3] after praising Stiles's method for detecting by nitric acid portions of the disease remaining after operation, concludes that in all cases there should be free removal of the skin, especially over the tumor,—very free, indeed, if the skin is actually the seat of the disease. There should be complete removal of the breast, bearing in mind its great extent, removal of the pectoralis fascia coextensive with the breast and right on to the sternum, along with a thin layer of the muscle behind the tumor and the main part of the breast, and complete clearing out of the axilla, and also of portions of the pectoralis major, if involved.

Extensive citations have thus been given with reference to the importance of removing the axillary glands, because it is only within a few years that this method has received general acceptance. It is beyond question that the great increase in cures reported during the few years past is dependent upon the more extensive and complete removal of the disease than in earlier operations, and this is the reason for the difference in statistics between early and late operators.

The dangers attending the clearing of the axilla, although great in the pre-aseptic period, have almost disappeared, and those dangers which have been feared from injury to vessels and nerves are, in the hands of skilful operators, easily avoided. It has become evident also that injury to these parts is not so serious as was formerly supposed. Billroth says that if the axillary vein is wounded it should receive a double ligature, and that death from entrance of air into the vein has been observed; also that branches of the axillary vein should be ligated two centimetres (three-fourths of an inch) from the vein, to avoid necrosis and hemorrhage. Ligation of the axillary artery does not produce the disturbance in circulation one would suppose. He has often done this, and has seldom observed œdema of the arm as a result. Langenbeck records two cases in which he was obliged to remove five centimetres of the brachial plexus with large vessels. The patients recovered from the operation, but one died one year

---

[1] British Medical Journal, September, 1892, p. 673.
[2] Deut. Zeitsch. f. Chir., 1892, p. 479.
[3] Lancet, London, August, 1892, p. 358.

FIG. 13.

FIG. 14.

Mobility of arm after removal of pectoralis major.

later from recurrence; the other case was living after two years. In a third case he was obliged to divide also the subscapular artery, and in this case gangrene and death resulted. Esmarch, in cases where the removal of the axillary glands is otherwise impossible, advises disarticulation of the humerus, as being a better operation than division of the brachial nerves and vessels.

Von Rotter reports three cases of Von Bergmann's. In one he ligated the axillary vein, in one the axillary artery, and in one both artery and vein, without producing long-standing œdema. In one case he opened the thorax, but closed the opening at once with a moist gauze tampon, and later stitched the muscle over it and secured union by first intention.

Dennis reports a successful case in which it was necessary to remove not only the breast and the contents of the axilla, but also the pectoralis major muscle and ribs. In this same connection, Billroth says that if the pectoralis major is involved the diseased portion should be removed. Resection of the ribs is not advisable. Multiple carcinomata of the skin cannot be successfully removed. If the axillary glands compress the nerves and vessels, operation is not advisable, and amputation of the shoulder-joint is preferable to the division of nerves and vessels.

The question of the removal of the pectoral muscles has also become one of interest. Kiewicz details a case in which, in order to clear the infra-clavicular fossa, both the pectoralis major and the pectoralis minor were divided. Poulsen, speaking of removing the entire pectoralis major, says, "The operation seems to me to be so great that one must well consider it." Gould[1] recommends the removal of the entire pectoralis major muscle when infiltrated by disease. Fowler[2] says that the operation is not rendered a much more serious one because of this added feature, and the functional disturbance is scarcely noticeable. Heidenhain thinks that the removal of the pectoralis major, when necessary, should be radical; it does not increase danger or bleeding, and interferes very little with the motion of the arm. In a discussion in London, the removal of the pectoralis, when infected, was recommended by Lane, but was considered inadvisable by Watson Cheyne and Eve.

The degree of mobility remaining after complete removal of the pectoralis major is shown in the accompanying plates of a woman from whom, on account of extensive involvement, it was necessary for me to remove the entire pectoralis major from the sternum to the humerus. She is now able to use the arm freely, and the degree of mobility shows that it is thoroughly satisfactory. After the breast has been removed, it requires but a moment to divide the insertion of the pectoralis from the humerus and to dissect it entire from the front of the thorax, and the hemorrhage is easily controlled.

---

[1] International Clinics, Philadelphia, 1892, vol. i. p. 217.
[2] Brooklyn Medical Journal, 1890, p. 718.

The dangers of operations for carcinoma mammæ, and their character, are illustrated by the following statistics from Billroth's clinic, recorded by Winiwarter :

Among thirty-four deaths from operation, five were due to sepsis, or 14.7 per cent. ; one to carbolic-acid poisoning, or 2.9 per cent. ; eight to pyæmia, or 24.4 per cent. ; three to pyæmia with erysipelas, or 8.6 per cent. ; thirteen to erysipelas, or 38.2 per cent. ; two to hemorrhage, or 5.8 per cent. ; one to pleurisy, or 2.9 per cent. ; one to peritonitis, or 2.9 per cent.

These thirty-four deaths occurred in one hundred and forty-three operations at the beginning of the introduction of antiseptic surgery.

Billroth gives the following facts. Up to 1877, before antiseptic methods were introduced, he operated upon three hundred and five cases of carcinoma mammæ, with 15.7 per cent. of deaths. Of these cases, 6.7 per cent. were extirpation of the breast alone ; 21.3 per cent. were extirpation of the breast and axillary glands. From 1877 to 1879 he operated upon sixty-eight cases, with 5.8 per cent. of deaths. In cases of extirpation of the breast alone there were no deaths ; in those of extirpation of the breast and axilla together there were 10.5 per cent. of deaths. Of these, one was from hemorrhage and three were from sepsis. He says that, deducting deaths from hemorrhage, the percentage of deaths in sixty-eight operations was 4.4, or three cases. He closes by saying that he would not be surprised to learn that an operator might in the future reach one hundred per cent. of successful operations, since much depends upon the experience of surgeons and assistants.

Watson Cheyne,[1] speaking of Lister's operations, says that from 1871 to 1877 he performed thirty-seven excisions of the mamma antiseptically, with two deaths,—one from erysipelas, the other from septicæmia. Between 1877 and 1880, he says, Professor Lister made sixteen excisions of the breast and axillary glands, with two deaths, both operations being very extensive, the patients dying of shock within thirty-six hours.

Butlin (op. cit.), considering the same subject, takes six hundred and five cases. Five hundred and nineteen of these are from Gross, including the cases of Henry, Oldekopf, Winiwarter, and one hundred of his own. Of the six hundred and five, ninety-six, or 15.85 per cent., died from causes referable to the operation. Two or three deaths resulted from bronchitis, not referable to the operation. The majority of deaths were from pyæmia, septicæmia, and erysipelas ; some were from gradual exhaustion several days after the operation, and some from pleurisy or pneumonia. He says that there is reason for believing that the latter disease may result directly from exposure during operation. Of thirty deaths reported by Henry out of one hundred and forty-seven operations, 8 per cent. followed amputation of the breast alone, and 22 per cent. followed removal of the breast and axillary glands.

---

[1] Antiseptic Surgery, p. 373.

Dietrich reports from 1870 to 1880, from forty-four operations, nine deaths; from 1880 to 1890, from one hundred and forty operations, only eight deaths. The causes of these deaths were: pneumonia, one; erysipelas, three; metastasis in the brain, one; the remaining deaths were from metastasis in other organs. During the last nine years, he says, there were no deaths from erysipelas.

Rotter reports Von Bergmann's operations as follows. One hundred and fourteen operations, with six deaths. One died from ulcer of the stomach, one from collapse after double amputation, one from embolism of the brain, one from septic pleurisy, and two later from unknown causes.

Schmidt, reporting Küster's cases, says that from 1871 to 1885 there were two hundred and twenty-two cases, with twenty-four deaths (10.81 per cent.); from 1883 to 1885, ninety-six cases, with five deaths (5.2 per cent.). Of these cases, twenty-five were in 1883, with three deaths (12.07 per cent.); twenty-five in 1884, with one death (4.7 per cent.); and forty in 1885, with one death (2.5 per cent.). In 1886 there were no deaths. The large number of deaths in 1883 is ascribed to the much greater extent of operations then undertaken, with the introduction of antiseptic surgery. Terrillon says that the operation is almost without risk. Dennis reports seventy-one cases of extirpation of the breast, with but one death, and that death occurred from hæmophilia.

It thus becomes apparent that, with the increased experience gained in aseptic surgery in operations upon the breast, not only has the percentage of permanent cures increased, but the number of deaths resulting from operation has largely diminished, and it is possible that a time is near at hand when the prophecy made by Billroth may be realized, and some surgeon may extirpate the breast and axillary glands in one hundred cases without a death.

The removal of recurrent growths is widely advocated. Billroth says that in one case he saw a permanent cure follow the third operation. Terrillon reports one in which he performed five successive operations with apparent benefit. The most remarkable is a case of spindle-celled sarcoma, reported by Gross, in which fifty-two tumors were removed by twenty-three distinct operations, and the patient was living eleven years after the last operation.

The method of operating which is most widely in vogue at the present time follows closely that which was first suggested by that great surgeon, Richard Volkmann. Küster[1] describes it as follows:

He makes a long incision below the breast, reaching from near the sternum to the axillary space. He then dissects the breast free from the thorax from below upward, making the incision above the breast last. The borders of the pectoralis major, pectoralis minor, and latissimus dorsi are laid bare. He then locates the axillary vein at the distal extremity of

---

[1] Deut. Gesell. f. Chir., 1883, p. 295.

the axillary space, which is done by cutting carefully down, with the knife laid flat, until the blue color of the vein is distinguished. Next he clears the axillary space from its lower to its upper extremity, and, by keeping the vein constantly in view, avoids injury to the axillary artery and the brachial plexus, since both are underneath the vein. It is important to preserve three nerves,—the subscapularis to the subscapular muscle, the nerve to the teres major, and the nerve supplying the latissimus dorsi. The author thinks that the impaired motion of the arm is due not to the cicatrix, but to changes in these muscles resulting from destruction of the nerve-supply. When these nerves are preserved, the motion of the arm is not hindered. The nerve destroyed is the intercosto-humeral.

One who has not performed the operation by this method can scarcely appreciate its advantages. By laying bare the axilla at its outer extremity and finding the vein, the safest possible guide is obtained to enable one to preserve it and the other important contents of the axilla from injury. Having the vein thus distinctly in view, unless the malignant infiltration of the glands, closely surrounding the vein and its branches, is very great, it is not a difficult matter, even with the sharp edge of a scalpel, rapidly to set free the entire axillary contents without serious injury to any part. If one prefers, or is inexperienced, he would probably do better with curved scissors or with the handle of a scalpel in making the dissection. By this method the axilla may easily be cleared up to the line of the clavicle. The latter part of the dissection is greatly aided by rotating the arm slightly inward and lifting it well upward by the side of the head. It is of advantage, also, to lift the pectoralis major and pectoralis minor muscles upon a blunt retractor, thus gaining space and light. The branches of the axillary vein and axillary artery can thus be easily seen and seized by a pair of hæmostatic forceps before division. It is best either to ligate these at once or to take great care in holding the forceps, lest by pulling upon them the vessels be torn off so close to the main trunks that ligation will be impossible.

In order to enable one to determine whether or not the diseased tissue has been entirely removed, Stiles[1] has recommended the following. The breast, immediately after its removal and the washing away of all blood, is placed in a five-per-cent. solution of nitric acid for about ten minutes, and is then washed in running water from three to four minutes. By this method the connective tissue becomes translucent, homogeneous, and somewhat gelatinous, and is rendered tough and like india-rubber. The parenchyma of the gland remains more or less dull grayish-white and opaque, owing to the coagulation of the highly albuminous epithelial cells; the fat is unaltered. The carcinomatous tissue behaves in the same way as the parenchyma, and is rendered even denser and more opaque. In carcinomata which are quite rich in cells the tissue resembles boiled white

---

[1] Transactions of the Medico-Chirurgical Society, Edinburgh, 1891, 1892, p. 40.

of egg, though of a grayish color. The characteristic arrangement of the parenchyma is generally sufficient to distinguish it from the cancerous tissue.

Stiles suggests that this method may be employed while the axilla is being cleared, and by it any points which have been left behind can be demonstrated on the corresponding surface of malignant tissue upon the removed breast. By marking the position in which the breast was removed, the corresponding point of tissue remaining can be found and extirpated. This method is highly praised by Chiene, of Edinburgh, and other operators.

Ashhurst (*loc. cit.*) says that it is important that the patient should be kept thoroughly covered during operation, since the exposure of the thorax may cause pleurisy, congestion of the lungs, and even pneumonia. He advises that the wound be kept thoroughly protected. Butlin (*op. cit.*), in speaking of operation, says that it is very difficult to preserve asepsis in operations on the breast, because of the axilla.

Favoring the clearing of the axilla as the primary part of the operation, upon this account, Duret[1] says partial extirpation of the breast calls for stricter antisepsis and more minute care than total extirpation, because in the former one makes large openings into lymph-spaces and milk-canals, thus giving rise to accidents of retention. These cases especially require careful drainage. He makes occasional partial extirpations in young women with limited disease, but accompanies this with the complete dissection of the axilla. Nancrede[2] says, " I now cut into the axilla first, and, if I cannot remove the glands, I close the wound and let the breast alone."

In removing the breast and clearing the axilla a large amount of tissue is exposed. It is important that this should be protected, both on account of the possibility of infection and because of the danger arising from a long exposure of the thorax, bringing with it the possibility of damage to the respiratory tract. After the breast has been extirpated up to the line of the axilla, and the divided vessels have been thoroughly secured by hæmostatic forceps, it is well to cover the wound with a sterilized towel wrung out in hot distilled water, and then to proceed with the dissection of the axilla. When this is completed the thoracic wound may be again uncovered, all forceps removed, and the few vessels which continue to bleed may be ligated. It will be found, however, that most of them have ceased. As has been previously stated, in dissecting the axilla the immediate branches of the axillary vein and axillary artery should be ligated as soon as possible, else, if the forceps are left hanging from them, they may tear openings into the vessels, causing hemorrhage difficult to control. The remaining vessels on which hæmostatic forceps have been placed may be ligated after those of the axilla have been secured. It is of primary

---

[1] Journal des Sciences Médicales de Lille, 1890, p 558.
[2] Transactions of the American Surgical Association, 1891.

importance to check thoroughly all hemorrhage, for upon this depends the successful healing of the wound.

For the operation from eighteen to twenty-four forceps are of great convenience, especially if the breast is large and very vascular.

Having stopped the hemorrhage, the wound may be united by a continuous suture. The flaps will bear much greater tension than would be supposed by one inexperienced in the operation. In inserting the continuous suture, the lower border of the wound will be found to be longer than the upper one, consequently each stitch must take in more tissue along the lower than along the upper border, and it is easy in this manner to unite the entire wound with little puckering. At times, when the amount of integument is small, it is possible to unite the surface by first stitching together the axillary extremity of the incision for about one-third of its length, then uniting the sternal portion of the incision for a similar distance, and finally uniting the central portions of the lower border of the wound to each other. When united in this manner, the wound has three lines of sutures radiating from a central point. If it is not possible thus to unite the borders of the wound without too great tension, assistance may be gained by retention sutures of silver wire, inserted some distance from the border of the wound and attached to lead plates, thus holding the flaps more firmly together; after this the borders of the wound may be united by ordinary sutures.

In cases where it has been impossible to cover the breast, on account of the large amount of integument removed, I have not hesitated to proceed at once to cover the opening by large grafts of skin taken from the thigh of the patient, after the method of Thiersch. For this purpose a broad-bladed razor is highly desirable. The skin of the thigh should be thoroughly disinfected. By holding the thigh so that the razor shall be in the horizontal position while cutting the grafts, and keeping water dropped carefully upon it, large skin-grafts can be made to lie upon the razor, and flaps be transferred having a breadth of from half an inch to one inch, and any length required, so that for one skilled in the operation but a few moments are necessary to close a large opening. The wound should be completely covered by the skin thus obtained, great care being taken to place the denuded surface of the graft thoroughly in apposition with the denuded surface of the thorax. When the opening is entirely covered, a piece of thin oil-silk protective should be placed over the grafts, extending a quarter of an inch beyond the margin of the wound. If it is not possible thus to cover the open surface at the time of the operation, on account of the feeble condition of the patient, it may be done at a later period, should the opening be sufficiently large to demand it.

In dressing the wound remaining after extirpation of the breast, whether skin-grafts are used or not, an abundant sterilized dressing is required. A good method is first to express from the wound any small amount of blood which may remain after closing it by suture. If this is done, the

Fig. 15.

Bandage of the breast after operation.

hemorrhage having first been carefully controlled and the surface of the wound held closely in apposition before and during the application of the dressing, no blood will remain beneath the flaps and no drainage will be necessary. If one has not thoroughly stopped the bleeding, and is not expert in the application of dressings, it would be unwise to omit drainage, since otherwise the retained blood may fail to organize, and suppuration may result. After one has become thoroughly practised in the application of dressings, drainage may be done away with, and in a large proportion of cases the wound will heal through its entire extent by first intention, under the primary dressing. The dressing should cover the surface to a wide distance from the border of the wound, and a firm pad should be placed under the arm, so as to press upward into the axilla. Sufficient gauze and cotton should be put behind the arm, over the elbow, over the front of the chest, and upward above the clavicle, completely to occlude the wound. A bandage may then be placed over the entire thorax and arm, leaving out only the hand of the affected side, and over all a starch bandage, to retain the dressing thoroughly in position, so that any movement on the part of the patient shall be impossible. (Fig. 14.) The first dressing may be left from six to eight or even ten days, provided that there is no evidence of inflammation. Should inflammation arise, it will be necessary to remove the dressing earlier and to inspect the wound. Upon the removal of stitches after from six to ten days, a small strip of iodoform gauze one inch in width and from four to six layers in thickness may be laid over the wound, and long strips of adhesive plaster applied to the thoracic wall to prevent tension upon the newly-formed cicatrix.

CHAPTER XIX.[1]

CUTANEOUS DISEASES PECULIAR TO WOMEN.

BY LOUIS A. DUHRING, M.D., AND MILTON B. HARTZELL, M.D.

SEX exercises an influence upon the production of diseases of the skin through peculiarities of anatomical structure, through physiological functions, and through pathological states of sexual organs. A small number of diseases of the skin occur so much more frequently in women than in men that they may be said to be peculiar to the female sex. Examples of these are Paget's disease of the nipple and impetigo herpetiformis. Other diseases, while common to both sexes, are distinguished in women by special localization and clinical symptoms due to differences in anatomy. Another distinguishing feature of these diseases is to be found in the etiological relationship which they bear to internal organs, being associated with functional and pathological disturbances of the reproductive and nervous systems. Thus, while resembling in their external features cutaneous maladies seen in man, they are noteworthy in that they are dependent upon causes associated with the sex of the subject. Anæmia and chlorosis, so much more frequent in women than in men, whether primary or secondary to disease of other organs, affect the cutaneous system as well as the general nutrition, and give rise to various skin manifestations. The mode of life of woman, while diminishing her liability to certain diseases, particularly those known as professional dermatoses, or diseases of the skin arising from occupation, favors either directly or indirectly the occurrence of others. Owing to the greater impressibility of the nervous system in females, neurotic diseases of the skin occur more frequently than in males, manifesting themselves either as structural alterations or, as is more frequently the case, as disorders of sensation.

DISEASES DUE TO SPECIAL ANATOMICAL STRUCTURE.—The skin covering organs peculiar to females is frequently the seat of disease which in many instances presents features differing from the ordinary type as seen elsewhere. The breasts are not infrequently the seat of eczema,

---

[1] In the preparation of this chapter the writers have endeavored to direct attention to the diseases of the skin which are commoner in women than in men, and to point out the sexual causes which are liable to produce them. No attempt has been made to enter upon the treatment of the diseases incidentally referred to. The aim has been to avoid as much as possible all resemblance to the style of a text-book, or treatise, on diseases of the skin.

which begins upon the nipple and extends to the surrounding parts, forming a circular patch having the nipple in the centre. In severe cases the nipple is retracted and covered with crusts. This variety of eczema is apt to be of long duration, and is not readily amenable to treatment. It occurs in most instances in pregnant and nursing women, particularly the latter, but is occasionally seen in the unmarried as well, in the last-named being often confined to the nipple. In this connection it may be proper to recall the fact that the nipples and areolæ are favorite localities for invasion by the itch mite, and a general eczematous eruption, in a woman, in this region more marked than elsewhere should suggest the possibility of the eruption being scabies.

In connection with eczema of the nipple, mention should be made of the malady first described by Sir James Paget, and since called by writers **Paget's disease of the nipple.** This affection usually begins upon the nipple, and spreads thence to the areola and often beyond, in some cases involving the skin over the greater part of the gland. As a rule, it is unilateral, the right side being more frequently affected than the left. It begins with the formation of corneous incrustations upon the nipple, which are firmly adherent to the underlying skin. Upon removing them, the surface beneath is seen to be reddened, superficially excoriated or ulcerated, and fissured. With the progress of the disease the areola becomes involved; its surface, at first red and covered with small scales, becomes excoriated and discharges a yellowish, viscid fluid, which soon gives rise to crusts. When fully developed, the diseased area is bright red and finely granular, oozes abundantly, is more or less circular in shape, with the nipple in the centre, and is sharply circumscribed in outline, the margins in some cases being slightly elevated above the surrounding healthy skin. These features are characteristic of the disease and serve to distinguish it from ordinary eczema of the breast, with which it is apt to be confounded, particularly in its early stages. Soon in the course of the disease parchment-like induration of the superficial tissues takes place, which feels "like a penny felt through a cloth." Retraction of the nipple is a peculiar feature, which, beginning early, sometimes leads to its complete disappearance. Itching and burning in varying degrees of intensity are present from the beginning. The general health remains unaffected until the final stages of the disease. Within a period varying from a few months to many years cancerous degeneration makes its appearance, beginning either superficially upon the ulcerating surface or, what is more commonly the case, in the deeper parts, —in the glandular tissue. When this stage is reached the symptoms are those of ordinary mammary carcinoma, consisting of deep-seated, lancinating pain and extensive ulceration, together with involvement of the lymphatic glands of the axilla.

The treatment in the early stages, while the diagnosis may yet be in doubt, is much the same as in eczema. All irritating applications should be avoided. When, however, the diagnosis of Paget's disease has been

established, vigorous measures should be adopted at once. The diseased surface should be thoroughly curetted and afterwards cauterized with pure carbolic acid or diluted caustic potash, or treated with a twenty- to fifty-per-cent. plaster of pyrogallol. When cancerous degeneration of the deeper structures has taken place, amputation of the breast is demanded.

Eczema frequently attacks the genitalia in women. It may be confined to the labia, but it usually extends to the surrounding parts,—the mons veneris, the inner surface of the thighs, the perineum and anus, and occasionally the vagina. At times there is abundant exudation of serum, the parts being swollen and more or less crusted. In other cases the skin is dry, red, and scaly. The itching is often of the most distressing character, and is apt to occur paroxysmally. A leucorrhœa may act as the direct exciting cause, or it may be a consequence of pregnancy or of tumors of the uterus or the ovaries. Care should be taken to distinguish between eczema vulvæ and pruritus vulvæ, since these two affections are not infrequently confounded. An accurate diagnosis can be made, as a rule, only by a careful ocular inspection of the parts affected. It is of importance to remember that eczema of the genitalia is a frequent complication of glycosuria, or diabetes mellitus. The urine should always be examined for sugar. The treatment of this distressing variety of eczema must be conducted on general principles. If uterine or ovarian disease be present, as is frequently the case, this must be appropriately treated before a permanent cure can be expected. In cases of eczema the result of glycosuria, constitutional as well as local treatment must be employed. Among the local remedies, carbolic acid, applied as a lotion in the strength of ten to fifteen grains to the ounce of water, is extremely useful. Applying a cloth dipped in hot water as hot as can be borne for a few minutes will sometimes relieve the itching for a considerable period. Painting the parts with a solution of nitrate of silver in nitrous ether (five or ten grains to the ounce) is another remedy which may be referred to. Salicylic acid and resorcin are also both valuable remedies.

DISEASES ASSOCIATED WITH PHYSIOLOGICAL FUNCTIONS PECULIAR TO WOMEN.—The performance of the various functions special to the female sex is often accompanied by cutaneous disorders which manifest themselves either as disturbances of function, alteration of sensibility, increased or diminished action of the glands, or structural changes by the formation of the various cutaneous lesions. The two most important functions of the sex, menstruation and gestation, play an important *rôle* in the causation of affections of the skin. The former is attended by a considerable variety of cutaneous disorders, the most common of which is **acne.** It is a matter of common observation that this affection is apt to be much worse during the menstrual period. In some cases it occurs mainly at this time, disappearing more or less completely in the interval between the menses. Occasionally it undergoes no decided change during menstruation. In some women **herpetic eruptions** upon the lips coincide with each menstrual period. Less

frequently herpes of the vulva occurs in the same manner. Cutaneous hemorrhage in the form of **purpura** occasionally manifests itself with each menstrual period. E. Morin gives the notes of a case where for ten years purpura appeared two or three days before each menstruation and disappeared at the end of eight or ten days. Certain diseases which have appeared independently of menstruation—*e.g.*, eczema—frequently become worse during the menstrual flow. Besides these structural changes in the skin, functional disturbances are of common occurrence, such as **flushing,** various forms of **erythema,** and **hyperidrosis,** confined to a single region, as the face or the palms. In disorders of the function, as in dysmenorrhœa, amenorrhœa, and irregular menstruation, they are still more frequent. Certain cutaneous maladies are likewise common during the **menopause,** those which are under the influence of the nervous system predominating. Acne rosacea, eczema, and pruritus vulvæ are often seen at this time, the itching in the two latter being usually of the most aggravated character. Abnormal development of hair and deposit of pigment are also observed at the climacteric period.

Various disorders of the skin accompany the function of **gestation.** In addition to the deposit of pigment which occurs in the mammary areola and the linea alba during pregnancy, patches of pigmentation, round, oval, or irregular in shape, varying from a light yellow to a deep brown or even almost black, are frequently observed, situated oftenest upon the face, but in some cases covering considerable areas upon the trunk. This pigmentation continues during the period of gestation and disappears after parturition. An excessive growth of hair has been occasionally observed. Thus, Slocum reports a case in which, during three successive pregnancies, an abnormal growth of hair occurred upon the chin, falling off with the return of menstruation. Eczema of the genitalia and pruritus vulvæ are common during the period of gestation, and are often the source of much annoyance and even great distress, imperatively demanding treatment, and in many cases taxing to the utmost therapeutic resources. Psoriasis is a disease which is sometimes influenced in a striking manner by pregnancy, in some cases being improved, in others distinctly aggravated. The latter occurrence is noted particularly in the case of women who are naturally weak and who are further debilitated by gestation. Pointed condylomata growing luxuriantly upon the vulva have been observed which rapidly disappeared after delivery.

Among the cutaneous disorders of **pregnancy** there is a severe disease which was first described by Hebra, in 1872, with the name **impetigo herpetiformis.** Since that date further knowledge on the subject has been contributed by several writers, notably by Kaposi. The limited number of cases recorded have occurred almost exclusively in women, and, moreover, in the pregnant and puerperal states. All of Hebra's original series of five cases occurred in women, and all but one terminated fatally. While within the past few years it has been shown that the disease may also in rare

instances appear in men, it must nevertheless be regarded as being a disease of the skin to which women are particularly prone. It is characterized by numerous superficially seated, pin-head-sized, miliary pustules, which begin as such and remain pustules throughout their course. They are always arranged in clusters and groups, new lesions tending to form on the periphery of older patches, the disease thus creeping onward and gradually invading new territory. The lesions soon become confluent and crusted, considerable crusting often taking place, much as occurs in pustular eczema, but there does not exist the disposition to continual oozing so common in eczema. A series of new pustules form about the original patch, which inclines to heal in the centre. The process thus extends, runs an acute or a subacute course, and may involve large areas, having predilection especially for the genitalia, the abdomen, the trunk generally, and the thighs. In severe cases patches as large as a hand may be found, red and inflamed, discharging a puriform fluid which dries into greenish and brownish foul smelling crusts. The disease is accompanied with chills and marked fever, and is almost invariably fatal.

The symptoms, however, are not always so sharply defined as above described; some cases have been observed (as in one by C. Heitzmann) where the lesions are more vesicular or more bullous in character, as the names herpes impetiginiformis, herpes pyæmicus, herpes vegetans, and herpes puerperalis, given by earlier observers, clearly indicate. One of us (Duhring) has expressed himself in effect that the disease occasionally possesses certain symptoms in common with the more polymorphous disease dermatitis herpetiformis, a view which has been insisted upon by S. Sherwell. The nature of the process must be regarded as being in most cases septic.

The diagnosis in typical cases is not difficult, the pustules and their arrangement and grouping being peculiar. The severe general disturbance, and the course of the disease (in all cases grave and frequently terminating fatally) must also point to impetigo herpetiformis. It is most likely to be confounded with dermatitis herpetiformis, especially the pustular variety; also with pemphigus, and in particular with pemphigus vegetans, the latter being likewise a fatal disease in almost all instances. All these affections have much in common as regards their etiology and pathology, and from such a stand-point might properly be grouped together. The nervous system is profoundly impressed in all of them, but especially so in impetigo herpetiformis and pemphigus. From the unfavorable history of the disease in reported cases, no specific treatment can be recommended. Asepsis locally and general tonic remedies afford the only means known at present of combating the disease.

Another disease met with in women, especially in connection with pregnancy, is **dermatitis herpetiformis**. It is a multiform, inflammatory, generalized disease of the skin, characterized by puckered, grouped lesions, particularly by erythema of the form common to erythema multiforme;

vesicles, minute, pin-head-sized, or larger; blebs, variously sized and shaped; and pustules similar in form with the vesicles and blebs. The lesions tend to appear in crops, are distinctly herpetic, and do not incline to rupture. The affection is accompanied by intolerable itching, and pursues in most cases a chronic course. It tends to recur. It is intimately associated with the nervous system, as shown by numerous recorded observations. In women it occurs at times in connection with pregnancy, constituting the so-called "herpes gestationis" of some authors. It is most apt to appear during the latter part of pregnancy, and almost invariably continues until after delivery; in some cases it first appears after parturition. In either case the cause may be found in disturbance of the nervous system. The trunk, thighs, and arms are the regions usually invaded; in some cases the eruption becomes universal.

It is liable to be mistaken for vesicular and pustular eczema, and also for pemphigus and impetigo herpetiformis. It differs in its course from the two last-named diseases in not tending to terminate fatally. Occasionally cases show complications. Constitutional symptoms, as malaise, chilliness, and alternate sensations of heat and cold, together with general physical and mental depression, not infrequently exist in the graver cases. As stated, the itching and burning are usually marked, being more severe even than in vesicular eczema of similar development. The disease is of much more frequent occurrence than impetigo herpetiformis, and varies in the degree of its development.

Treatment is unsatisfactory, local remedies in particular having often but little effect in relieving the itching. Frictions with strong sulphur ointment, thus breaking down the lesions, may be employed with the most hope of affording relief. Internally, the nervous system should be treated in chronic cases with appropriate remedies. Arsenic is sometimes of value, but it is not so useful as in pemphigus, and in some cases even proves harmful.

Lactation in some instances calls forth disease of the skin. As has already been mentioned, eczema of the nipple is most frequently seen during this period, for reasons which are obvious. It is often extremely obstinate, resisting the ordinary remedies and demanding treatment of the most vigorous kind: in severe cases nothing short of weaning the child will succeed. Emollient and protective ointments containing zinc, salicylic acid, or carbolic acid may at first be tried, care being taken to remove them thoroughly before nursing; but if these fail to afford relief, stronger and more stimulating applications must be made, such as a strong solution of carbolic acid, resorcin, corrosive sublimate, or nitrate of silver. Another disease sometimes markedly influenced by lactation is psoriasis, the cutaneous manifestation tending in some cases to make its appearance first, in others to become worse, during this period. It may be viewed in most cases as being influenced by debility consequent on the drain upon the general system.

PATHOLOGICAL CONDITIONS OF THE UTERUS AND OVARIES.—These often exert an influence upon the skin similar to that produced by menstruation and pregnancy. Deposits of pigment in various situations—the so-called **chloasma uterinum**—are observed in connection with uterine and ovarian disease, functional and organic. These discolorations are sometimes associated with tumors of the uterus and ovaries. **Acne vulgaris** and **rosacea** are common cutaneous complications in disease of the female sexual apparatus. **Urticaria** is at times dependent upon the same cause. Hebra mentions the case of a woman with a flexion of the uterus in whom the introduction of the uterine sound produced an attack of urticaria, this having occurred fifteen times in succession. **Chromidrosis** and **seborrhœa nigricans**—rare diseases—occur most frequently in unmarried women the subjects of disease of other organs than the skin, the sexual apparatus or nervous system generally presenting evidences of functional or organic disorder. The color of the secretion varies, blue, black, and red being the most common. The face is the region oftenest affected. In cases of supposed colored sweat the utmost care should be exercised to eliminate all possibility of wilful or unintentional deception.

HYSTERIA.—To this peculiar condition of the nervous system, characterized by a variety of symptoms, some of them difficult of definition, must be attributed the manifestation of some of the commoner diseases of the skin as well as certain rare or anomalous affections. In some instances characteristic hysterical symptoms are present, in others indefinable symptoms exist. In some cases the cutaneous disturbance is insignificant, slight, and transient, while, on the other hand, it is occasionally severe or peculiar. Hysteria may produce a profound influence upon the nervous centres, causing varied manifestations to appear on the skin. The cutaneous disease may be connected with the vaso-motors or with nerve-trunks and branches, producing disturbances of nutrition, superficial or deep-seated, more frequently the former. Occasionally they are of reflex origin. Among the commoner affections may be mentioned the superficial congestions which are grouped under the general heading of **erythema**. These may be simply hyperæmic, or congestive, as in flushing, especially of the face and particularly of the cheeks,—the "flush centres,"—or exudative, giving rise to multiform inflammatory erythema. Of the latter there are many forms, the most frequent being a diffuse erythema occupying a small or a large area. **Urticaria** may also be referred to as a not uncommon manifestation. Among the glandular diseases, **chromidrosis** and **seborrhœa**, especially seborrhœa. nigricans of the orbital region, may be mentioned. Of the still rarer diseases, those accompanied by hemorrhagic effusions through the glandular ducts (**hæmatidrosis**) into the corium, constituting so-called "bleeding stigmata," as occurred in the well-known case of Louise Lateau, and "neurotic excoriations," as reported by Erasmus Wilson and other observers, are striking and peculiar. Their existence was formerly doubted and even denied by some authors. While in some of the cases the

lesions are the result of artifice (with the view to deceive or to excite sympathy) on the part of the woman herself, there is no doubt that the majority of cases are examples of genuine disease.

A series of remarkable cases, similar in their history and clinical manifestations, characterized for the most part by erythematous, vesicular, bullous, and gangrenous localized lesions, pursuing usually a chronic course, and having a resemblance to herpes zoster, have been reported by Kaposi, Kopp, Doutrelepont, Montgomery, and one of us (Duhring). These cases have been described under such titles as " zoster gangrænosus recidivus atypicus hystericus," " pemphigus neurotico-traumaticus," " hysterical spontaneous gangrene," " traumatic neurosal pemphigus," " gangræna cutis acuta multiplex," and " dermatitis vesiculosa neuro-traumatica." The several titles are given here *in extenso* because they express the chief characteristics of the disease. They are peculiar in their mode of origin, which has usually been traumatism, often slight or insignificant, and in itself insufficient to account for the development of the subsequent cutaneous disease. Thus, in some cases the disease has originated from the prick of a pin or needle or from a burn, and a curious feature noted in some cases is that the cutaneous disease did not appear at the site of the traumatism, but near by or even elsewhere. From this observation it would seem that the disease of the skin was reflex in character. In almost all of these cases there is marked hysteria. The possibility of their artificial production is to be excluded.

Cutaneous **hyperæsthesia** frequently occurs in hysterical women, and is in marked cases so extreme that the lightest touch gives shock or pain. This hyperæsthesia is not limited to definite nerve-tracts, and it is distinguished by its trifling character, changing its situation from time to time without perceptible reason. On the other hand, anæsthesia more or less complete may exist. This is usually unilateral, occupying the entire half of the body, or it may be limited to certain areas. In hysterical hemianæsthesia the anæsthetic area is usually sharply limited by the median line of the body, and, like the hyperæsthesia, it often shifts about, passing from one side to the other in the most inexplicable manner. **Analgesia**, or loss of perception of pain, also occurs, tactile sensibility being impaired.

A rare form of disease, characterized by the development of a peculiar, large and bulky, localized and circumscribed, brownish, corrugated, dry, non-offensive crust, arising from an erythematous, non-ulcerated, unbroken skin, accompanied by rapid respiration and other hysterical symptoms, has been described and figured by S. Weir Mitchell. One of us (Duhring) also had the opportunity of observing and studying this case, which might properly be designated as an " hysterical epithelial crust." It was the size of an adult hand, from one-half to three-quarters of an inch in thickness, and resembled the bark of an oak-tree. The lesion had existed for a year or more, and had recurred several times after forcible removal, which operation caused great pain. On one occasion it was removed in large fragments by Dr. Mitchell, under hypnotism. The epithelium beneath the crust was

reddened, thin, dry, without breach of continuity, and the corium was the seat of a chronic, peculiar, cold inflammation. There had never been any discharge or ulceration.

Factitious diseases of the skin, also called "artificial" and "feigned" skin-diseases, produced by the patient with various agents, mostly mechanical and chemical, are met with chiefly in hysterical women, more especially in young women. They are produced with the view of exciting sympathy, of deceiving, or of shirking work or some irksome duty, and are induced by scratching or rubbing with the finger-nail or some other instrument, or by friction, or by applying some chemical irritant, discutient or caustic, with the idea of simulating disease. While such productions are rare, they are occasionally met with, and sometimes in women who cannot be regarded as hysterical, but who are rather to be considered as malingerers. The same form of malingering has been noted in the case of healthy men in the army and navy, with the view of shirking duty.

Feigned diseases are usually met with on parts of the body easily accessible to the patient, and in most cases are seen upon the anterior surface and in right-handed persons on the left side. While the appearance of the eruption rarely corresponds to that of any of the ordinary cutaneous diseases, the diagnosis is often perplexing. A conclusion should never be reached hastily.

INDEX.

THE END.

MEDICAL PUBLICATIONS

ISSUED BY

YOUNG J. PENTLAND.

EDINBURGH: Teviot Place.
LONDON: 38 West Smithfield, E.C.

Aitchison, Robert S., M.B., C.M., F.R.C.P.Ed.,
Visiting Physician, St. Cuthbert's Poorhouse Hospital.

SYNOPSIS OF THERAPEUTICS. Arranged for the use of Prescribers. With Posological Table and an arrangement of the Poisons. 18mo, cloth, pp. xii., 120. Price **3s.**

Alexander, William, M.D., F.R.C.S.,
Honorary Surgeon, Royal Southern Hospital, Liverpool; Visiting Surgeon, Liverpool Workhouse Hospital; Acting Honorary Consulting Surgeon, Epileptic Institution, Manor House, Maghull.

THE TREATMENT OF EPILEPSY. 8vo, cloth, pp. **x.**, **220**, with 9 illustrations. Price **7s. 6d.**

Behrens, Dr. W. J.,
TEXT-BOOK OF GENERAL BOTANY. Translation from the Second German Edition. Revised by PATRICK GEDDES, F.R.S.E., Professor of Botany in the University of Dundee. 8vo, cloth, pp. viii., 374, with 408 illustrations, finely engraved on wood, and 4 analytical tables, new and cheaper edition. Price **5s.**

Berry, George A., M.B., F.R.C.S.Ed.,
Ophthalmic Surgeon, Edinburgh Royal Infirmary; Senior Surgeon, Edinburgh Eye Dispensary; Lecturer on Ophthalmology, Royal College of Surgeons, Edinburgh.

DISEASES OF THE EYE. A Practical Treatise for Students of Ophthalmology. Second Edition, 8vo, cloth, pp. xvi., 730, thoroughly revised and illustrated with many additional coloured plates from original drawings. Price **25s.** (*Pentland's Medical Series, Volume Second*).

THE ELEMENTS OF OPHTHALMOSCOPIC DIAGNOSIS. For the use of Students attending Ophthalmic Practice. Crown 8vo, cloth, pp. xii., 83. Price **3s. 6d.**

Billings, John S., A.M., M.D., LL.D., Harv. and Edin., D.C.L., Oxon.,

Member of the National Academy of Sciences, Surgeon, U.S.A., &c.

THE NATIONAL MEDICAL DICTIONARY. Including English, French, German, Italian, and Latin Technical Terms used in Medicine and the Collateral Sciences, and a Series of Tables of useful data. With the collaboration of W. O. ATWATER, M.D., JAMES M. FLINT, M.D., S. M. BURNETT, M.D., H. C. YARROW, M.D., FRANK BAKER, M.D., R. LORINI, M.D., J. H. KIDDER, M.D., WILLIAM LEE, M.D., C. S. MINOT, M.D., WASHINGTON MATTHEWS, M.D., W. T. COUNCILMAN, M.D. In two very handsome Imperial 8vo volumes, containing about 1600 pages. Price 50s. nett.

Bramwell, Byrom, M.D., F.R.C.P.Ed.,

Lecturer on the Principles and Practice of Medicine, and on Practical Medicine and Medical Diagnosis, in the Extra-Academical School of Medicine, Edinburgh; Assistant Physician, Edinburgh Royal Infirmary.

DISEASES OF THE HEART AND THORACIC AORTA. Large 8vo, cloth, pp. xvi., 783. Illustrated with 226 wood engravings, and 68 pages of lithograph plates, exhibiting 91 Figures—317 illustrations in all. Price 25s.

INTRACRANIAL TUMOURS. 8vo, cloth, pp. xvi., 270, with 116 illustrations. Price 14s.

STUDIES IN CLINICAL MEDICINE. In one handsome volume, crown 4to, cloth, bevelled boards, pp. xii., 344. Illustrated with numerous wood engravings and full-page lithograph plates, some coloured. Price 5s. 6d. nett.

Bruce, Alexander, M.D., F.R.C.P.Ed.,

Lecturer on Pathology in the School of Medicine, Edinburgh; Assistant Physician (formerly Pathologist), Edinburgh Royal Infirmary; Pathologist to the Royal Hospital for Sick Children.

ILLUSTRATIONS OF THE NERVE TRACTS IN THE MID AND HIND BRAIN AND THE CRANIAL NERVES ARISING THEREFROM. Royal 4to, illustrated with a series of 27 coloured plates from original drawings, and numerous figures throughout the text. Price 50s. nett.

Bruen, E. T., M.D.,

Assistant Professor of Physical Diagnosis, University of Pennsylvania; one of the Physicians to the Philadelphia and University Hospitals.

OUTLINES FOR THE MANAGEMENT OF DIET: or, The Regulation of Food to the Requirements of Health and the Treatment of Disease. Crown 8vo, cloth, pp. 138. Price 4s. 6d.

Burnett, Charles Henry, A.M., M.D.,

Aural Surgeon to the Presbyterian Hospital; one of the Consulting Aurists to the Pennsylvania Institution for the Deaf and Dumb; Lecturer on Otology, Women's Medical College of Pennsylvania, Philadelphia.

DISEASES AND INJURIES OF THE EAR: their Prevention and Cure. Crown 8vo, cloth, pp. 154, with 5 illustrations. Price **4s. 6d.**

Carmichael, James, M.D., F.R.C.P.Ed.,

Physician, Royal Hospital for Sick Children; University Lecturer on Disease in Children, Edinburgh.

DISEASE IN CHILDREN: A Manual for Students and Practitioners. Crown 8vo, cloth, pp. xvi., 520. Illustrated with charts. Price **10s. 6d.** (*Pentland's Students' Manuals.*)

Cheyne, W. Watson, F.R.S., F.R.C.S.,

Professor of Surgery, King's College; Surgeon to King's College Hospital, and Paddington Green Children's Hospital, London.

TUBERCULOUS DISEASE OF BONES AND JOINTS: Its Pathology, Symptoms, and Treatment. 8vo, cloth, pp. xvi., 374. Illustrated with numerous wood engravings throughout the text. Price **14s.** nett.

THE TREATMENT OF WOUNDS, ABSCESSES, AND ULCERS. Crown 8vo, cloth, pp. viii., 198. Price **3s. 6d.**

SUPPURATION AND SEPTIC DISEASES. Three Lectures delivered at the Royal College of Surgeons of England. 8vo, cloth, pp. xii., 102, with 4 illustrations. Price **5s.**

Crocker, H. Radcliffe, M.D., F.R.C.P.,

Physician to the Department for Diseases of the Skin, University College Hospital; Physician to the East London Hospital for Children; Examiner in Medicine at Apothecaries' Hall, London.

ATLAS OF THE DISEASES OF THE SKIN. In a series of Illustrations from Original Drawings with Descriptive Letterpress. To be issued in Fasciculi at intervals of Two Months. Fasciculi I. to XIII. now ready, price **21s.** each, sold only by subscription.

₊ Subscribers' names can now be received.

Cunningham, D. J., M.D., F.R.S.,

Professor of Anatomy and Chirurgery, Trinity College, Dublin.

MANUAL OF PRACTICAL ANATOMY. In 2 vols., crown 8vo., cloth, fully illustrated with wood engravings. Vol. I.—Upper Limb, Lower Limb, Abdomen; Vol. II.—Thorax, Head and Neck. Price per volume, **12s. 6d.** (*Pentland's Students' Manuals.*)

"Compend" Series (The),

A Series of Handbooks to assist Students preparing for Examinations.

COMPEND OF HUMAN ANATOMY, INCLUDING THE ANATOMY OF THE VISCERA. By Samuel O. L. Potter, M.D., M.R.C.P. (Lond.), Cooper Medical College, San Francisco. Fifth Edition, revised and enlarged, crown 8vo, cloth, pp. 289, with 117 engravings, and 16 full-page plates. Price **5s.**

COMPEND OF THE PRACTICE OF MEDICINE. By Daniel E. Hughes, M.D., late Demonstrator of Clinical Medicine in the Jefferson Medical College of Philadelphia. Fourth edition, revised and enlarged, crown 8vo, cloth, pp. 328. Price **7s. 6d.**

COMPEND OF OBSTETRICS. By Henry G. Landis, A.M., M.D., late Professor of Obstetrics and Diseases of Women in Starling Medical College. Third edition, thoroughly revised, enlarged, and improved, crown 8vo, cloth, pp. 118, with 17 illustrations. Price **4s. 6d.**

COMPEND OF SURGERY. By Orville Horwitz, B.S., M.D., Chief of the Outdoor Surgical Department, Jefferson Medical College Hospital. Fourth edition, revised, crown 8vo, cloth, pp. 272, with 136 illustrations. Price **5s.**

COMPEND OF DISEASES OF CHILDREN. By Marcus P. Hatfield, A.M., M.D., Professor of Diseases of Children, Chicago Medical College. Crown 8vo, cloth, pp. 186, with coloured plate. Price **4s. 6d.**

COMPEND OF PATHOLOGY AND MORBID ANATOMY. By H. Newbery Hall, Ph.G., M.D., Professor of Pathology and Medical Chemistry, Post Graduate Medical School; Surgeon to the Emergency Hospital, &c., Chicago. Crown 8vo, cloth, pp. 204, with 91 illustrations. Price **4s. 6d.**

COMPEND OF DENTAL PATHOLOGY AND DENTAL MEDICINE. By Geo. W. Warren, D.D.S., Clinical Chief, Pennsylvania College of Dental Surgery. Crown 8vo, cloth, pp. 109, illustrations. Price **4s. 6d.**

Dentistry, The American System of,

In Treatises by Various Authors. Edited by Wilbur F. Litch, M.D., D.D.S. Professor of Prosthetic Dentistry, Therapeutics, and Materia Medica, in the Pennsylvania College of Dental Surgery, Philadelphia. In three handsome volumes, royal 8vo, cloth, containing about 1000 pages each, with fully 1700 elaborate illustrations. Price **30s.** per volume, nett. For Sale by Subscription only.

Davidson, Andrew, M.D., F.R.C.P.Ed.,

Late Visiting and Superintending Surgeon, Civil Hospital; Professor of Chemistry, Royal College, Mauritius.

GEOGRAPHICAL PATHOLOGY. An inquiry into the Geographical Distribution of Infective and Climatic Diseases. In 2 vols., large 8vo, cloth, pp. xvi., 1008. Illustrated with maps and charts. Price **31s. 6d.**

HYGIENE AND DISEASES OF WARM CLIMATES. In a Series of Articles by Eminent Authorities. Edited by ANDREW DAVIDSON, M.D., F.R.C.P.Ed., Late Visiting and Superintending Surgeon, Civil Hospital; Professor of Chemistry, Royal College, Mauritius; Author of "Geographical Pathology." The Articles are contributed by SIR JOSEPH FAYRER; DRS. MACNAMARA; PATRICK MANSON; LANE NOTTER; E. A. BIRCH; R. W. COPPINGER; DAVID BRUCE; G. M. STERNBERG; MONTAGUE LUBBOCK; HY. CAYLEY; SONSINO; THE EDITOR; &c. &c. One volume, royal 8vo, cloth, pp. xx., 1014. Illustrated with engravings and full-page plates. Price **31s. 6d.**

Dercum, Francis X., A.M., M.D., Ph.D.,

Clinical Professor of Nervous Diseases in the Jefferson College, Philadelphia; President of the American Neurological Association.

A TEXT-BOOK ON NERVOUS DISEASES. By American Authors. Royal 8vo, pp. xvi., 1056, illustrated with 341 engravings and 7 coloured plates. Price **25s.** nett.

*** The list of contributors includes the following well-known names :—

N. E. BRILL, M.D.	JAMES HENDRIE LLOYD, M.D.
CHARLES W. BURR, M.D.	CHARLES K. MILLS, M.D.
JOSEPH COLLINS, M.D.	S. WEIR MITCHELL, M.D., LL.D.
CHARLES L. DANA, M.D.	CHARLES A. OLIVER, M.D.
F. X. DERCUM, M.D.	WILLIAM OSLER, M.D.
E. D. FISHER, M.D.	FREDERICK PETERSON, M.D.
LANDON CARTER GRAY, M.D.	MORTON PRINCE, M.D.
C. A. HERTER, M.D.	G. E. DE SCHWEINITZ, M.D.
GEORGE W. JACOBY, M.D.	WHARTON SINKLER, M.D.
W. W. KEEN, M.D., LL.D.	M. ALLEN STARR, M.D.
PHILIP COOMBS KNAPP, M.D.	JAMES C. WILSON, M.D.

Edinburgh Hospital Reports,

Edited by G. A. GIBSON, M.D., D.Sc., C. W. CATHCART, M.A.,
M.B., JOHN THOMSON, M.D., and D. BERRY HART, M.D.   To be
issued annually, 8vo, cloth, pp. xvi., 650 or thereby, handsomely
printed.   Illustrated with full-page plates and engravings.   Price per
volume, **12s. 6d.** nett.   Carriage free.   Volumes I. II. and III.
now ready.

Ewald, Dr. C. A.,

Extraordinary Professor of Medicine at the University of Berlin ; Director of the
Augusta Hospital.

DISEASES OF THE STOMACH.   Authorised translation, with
special additions by the author, by MORRIS MANGES, A.M., M.D.,
attending Physician, Mount Sinai Hospital, New York City.   Large
8vo, cloth, pp. xvi., 498, with 30 illustrations.   Price **16s.**

Felkin, R. W., M.D., F.R.S.E., F.R.G.S.,

Lecturer on Diseases of the Tropics and Climatology, School of Medicine, Edinburgh.

GEOGRAPHICAL DISTRIBUTION OF SOME TROPICAL
DISEASES AND THEIR RELATION TO PHYSICAL
PHENOMENA.   8vo, cloth, pp. 54.   Illustrated with 16 coloured
maps.   Price **5s.**

Frost, W. Adams, F.R.C.S.,

Ophthalmic Surgeon and Lecturer on Ophthalmic Surgery, St. George's Hospital ;
Surgeon, Royal Westminster Ophthalmic Hospital, London.

ATLAS OF OPHTHALMOSCOPY.   A Treatise on the Fundus
Oculi.   In press, to be issued in a handsome 4to volume, illus-
trated with a series of about 150 coloured plates from original
drawings from nature and numerous engravings in the text.

Fuller, Eugene, M.D.,

Instructor in Genito-Urinary and Venereal Diseases, Post-Graduate Medical School,
New York.

DISORDERS OF THE MALE SEXUAL ORGANS.   Large 8vo,
cloth, pp. 242, illustrated with 8 plates and 25 figures in the text.
Price **9s.**

Gibbes, Heneage, M.D.,

Professor of Pathology in the University of Michigan ; formerly lecturer on Histology
in the Medical School, Westminster Hospital.

PRACTICAL PATHOLOGY AND MORBID HISTOLOGY
8vo, cloth, pp. 362.   Illustrated with 60 photographic reproductions.
Price **12s. 6d.**

Gibson, G. A., M.D., D.Sc., F.R.C.P.Ed.,

Lecturer on the Principles and Practice of Medicine in the Edinburgh Medical School; Assistant Physician, Edinburgh Royal Infirmary; and

Russell, William, M.D., F.R.C.P.Ed.,

Assistant Physician, Edinburgh Royal Infirmary; Lecturer on Pathology and Morbid Anatomy in the Edinburgh Medical School.

PHYSICAL DIAGNOSIS. A Guide to Methods of Clinical Investigation. Second edition, Crown 8vo, cloth, pp. xvi., 376, with 109 illustrations, some coloured. Price **10s. 6d.** (*Pentland's Students' Manuals.*)

Graham, James, M.A., M.D.,

Late Demonstrator of Anatomy, Sydney University; Medical Superintendent, Prince Alfred Hospital, Sydney.

HYDATID DISEASE IN ITS CLINICAL ASPECTS. 8vo, cloth, pp. xvi., 204, with 34 full-page coloured plates. Price **16s.**

Hall, H. Newbery, Ph.G., M.D.,

Professor of Pathology and Medical Chemistry, Post-Graduate Medical School; Surgeon to the Emergency Hospital, &c., Chicago.

COMPEND OF PATHOLOGY AND MORBID ANATOMY. Crown 8vo, cloth, pp. 204, with 91 illustrations. Price **4s. 6d.**

Hare, Hobart Amory, M.D., B.Sc.,

Clinical Professor of the Diseases of Children and Demonstrator of Therapeutics in the University of Pennsylvania; Physician to St. Agnes's Hospital and to the Medical Dispensary of the Children's Hospital, Philadelphia.

SYSTEM OF PRACTICAL THERAPEUTICS. By Various Authors. Edited by HOBART AMORY HARE, M.D. In 6 volumes, royal 8vo, of about 500 pages each. Uniform with the "Cyclopædia of Children's Diseases" and "Systems of Gynæcology and Obstetrics." Price per volume, **12s. 6d.** nett, carriage free.

Hatfield, Marcus P., A.M., M.D.,

Professor of Diseases of Children, Chicago Medical College.

COMPEND OF DISEASES OF CHILDREN. Crown 8vo, cloth, pp. 186, with coloured plate. Price **4s. 6d.**

Haultain, F. W. N., M.D., F.R.C.P.Ed.,

Physician to the Royal Dispensary; late Clinical Assistant to Physician for Diseases of Women, Royal Infirmary, Edinburgh; and

Ferguson, J. Haig, M.D., F.R.C.P.Ed.,

Physician to the New Town Dispensary; late Resident Physician, Royal Maternity Hospital, Edinburgh.

HANDBOOK OF OBSTETRIC NURSING. Second edition, revised and enlarged, crown 8vo, cloth, pp. xvi., 244. Illustrated with 33 wood engravings. Price **5s.**

Hayem, Georges, M.D.,

Professor of Clinical Medicine in the Faculty of Medicine of Paris.

PHYSICAL AND NATURAL THERAPEUTICS: the Remedial Uses of Atmospheric Pressure, Climate, Heat and Cold, Hydrotherapeutic Measures, Mineral Waters, and Electricity. Edited by HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica, Jefferson Medical College, Philadelphia. Large 8vo, cloth, pp. 426, with 113 illustrations in the text. Price **14s.**

Hirst, Barton Cooke, M.D.,

Professor of Obstetrics in the University of Pennsylvania; and

Piersol, George A., M.D.,

Professor of Embryology and Histology in the University of Pennsylvania.

HUMAN MONSTROSITIES. In handsome folio, containing about 230 pages of text, illustrated with engravings and 39 full-page photographic plates from Nature. In four fasciculi. Price **25s.** each, carriage free. The edition is limited, and is for sale only by subscription.

Holland, J. W., M.D.,

Professor of Medical Chemistry and Toxicology, Jefferson Medical College, Philadelphia.

THE URINE AND THE COMMON POISONS, MEMORANDA, CHEMICAL AND MICROSCOPICAL, FOR LABORATORY USE. Second edition, revised and enlarged, oblong crown 8vo, cloth, pp. 65, with 28 illustrations. Price **4s.**

Horwitz, Orville, B.S., M.D.,

Chief of the Outdoor Surgical Department, Jefferson Medical College Hospital.

COMPEND OF SURGERY. Fourth edition, revised, crown 8vo, cloth, pp. 272, with 136 illustrations. Price **5s.**

Hughes, Daniel E., M.D.,

Late Demonstrator of Clinical Medicine in the Jefferson Medical College, Philadelphia.

COMPEND OF THE PRACTICE OF MEDICINE. Fourth edition, revised and enlarged, crown 8vo, cloth, pp. 328. Price **7s. 6d.**

Hygiene and Diseases of Warm Climates.
(*See* DAVIDSON.)

James, Alex., M.D., F.R.C.P.Ed.,

Lecturer on the Principles and Practice of Medicine in the School of Medicine, Edinburgh ; Assistant Physician, Edinburgh Royal Infirmary.

PULMONARY PHTHISIS. Its Etiology, Pathology, and Treatment. 8vo, cloth, pp. xii., 285. Price **9s.**

Jamieson, W. Allan, M.D., F.R.C.P.Ed.,

Extra Physician for Diseases of the Skin, Edinburgh Royal Infirmary ; Consulting Physician, Edinburgh City Hospital ; Lecturer on Diseases of the Skin, School of Medicine, Edinburgh.

DISEASES OF THE SKIN. A Manual for Students and Practitioners. Fourth edition, revised and enlarged, 8vo, cloth, pp. xvi., 676, with coloured illustrations. Price **21s.** (*Pentland's Medical Series, Volume First.*)

Johnstone, Alexander, F.G.S.,

Lecturer on Botany, School of Medicine, Edinburgh.

BOTANY. A Concise Manual for Students of Medicine and Science. Crown 8vo, cloth, pp. xvi., 260, with 164 illustrations and a series of floral diagrams. Price **6s.** (*Pentland's Students Manuals.*)

Journal of Pathology and Bacteriology.

Edited, with the Collaboration of Distinguished British and Foreign Pathologists, by GERMAN SIMS WOODHEAD, M.D., Director of the Laboratories of the Royal Colleges of Physicians (London) and Surgeons (England), Assisted in Special Departments by Sidney Martin, M.D. (Lond.) (*Pathological Chemistry*) ; S. G. Shattock, F.R.C.S. (*Morbid Anatomy and Histology*) ; G. E. Cartwright Wood, M.D. (Edin.) (*Bacteriology*) ; C. S. Sherrington, M.D., (Cantab.) (*Experimental Pathology*). Subscription, One Guinea per annum (in advance), post free.

It has been felt for some time that the want in this country of a Journal dealing specially with General and Experimental Pathology has militated most seriously against the free interchange of ideas, not only between English-speaking pathologists, but also between British and Foreign workers.

Although the Transactions of the Pathological Society deal with communications which are brought before its members, there is no medium in which longer articles, and especially those from workers throughout the United Kingdom and abroad, can be brought before a less limited circle of readers. It has been thought desirable, therefore, to found a Journal specially devoted to the publication of original contributions to General Pathology, Pathological Anatomy, and Experimental Pathology, including Bacteriology. These articles will, of course, be mainly from British Laboratories and Hospitals ; but the co-operation of many distinguished Continental, American, and Colonial Pathologists has been obtained, and papers written or edited by them will be placed before our readers.

In order to increase the interest and extend the usefulness of the Journal, it is intended that, in addition to original articles, critical summaries of work done in special departments of Pathology and Bacteriology shall from time to time be published. All articles appearing in the Journal will be signed.

The Journal appears at least four times a year, but it will be issued more frequently if necessary, in order to ensure publication of all papers as early as possible after they are received.

The numbers issued throughout the year form a volume, royal 8vo, of about 500 pages. They are printed on good paper, and freely illustrated with Woodcuts and Chromolithographs.

Amongst those who collaborate are the following:—Sir Henry Acland, Bart., Oxford ; S. Arloing, Lyons ; B. Bang, Copenhagen ; Alex. Barron, Liverpool ; W. H. Barrett, Belfast ; J. Rose Bradford, London ; Ch. Bouchard, Paris ; H. Buchner, Munich ; Angelo Celli, Rome ; Sir Charles Cameron, Dublin ; A. B. Charrin, Paris ; A. Chantemesse, Paris ; A. Chauveau, Paris ; W. Watson Cheyne, London ; H. Chiari, Prague ; Joseph Coats, Glasgow ; W. T. Councilman, Boston ; D. Drum-

mond, Newcastle; S. Delépine, Manchester; J. Dreschfeld, Manchester; Von Esmarch, Koenigsberg; R. H. Fitz, Boston; P. Grawitz, Griefswald; W. S. Greenfield, Edinburgh; H. Heiberg, Christiania; Victor Horsley, London; F. Hueppe, Prague; O. Israel, Berlin; E. H. Jacob, Leeds; E. Klebs, Zurich; Alfred Lingard, Poonah; Sir Joseph Lister, Bart., London; O. Lubarsch, Rostock; P. Marie, Paris; E. Metchnikoff, Paris; F. W. Mott, London; E. Nocard, Alfort; T. Oliver, Newcastle; J. Orth, Göttingen; William Osler, Baltimore; T. Mitchell Prudden, New York; J. F. Payne, London; J. M. Purser, Dublin; C. S. Roy, Cambridge; J. C. Salomonsen, Copenhagen; A. M. Stalker, Dundee; J. Burdon Sanderson, Oxford; J. Lindsay Steven, Glasgow; H. Stilling, Lausanne; I. Straus, Paris; T. P. Anderson Stuart, Sydney; R. Thoma, Dorpat; J. Batty Tuke, Edinburgh; L. Vaillard, Paris; Rud. Virchow, Berlin; H. Marshall Ward, Cooper's Hill; C. Weigert, Frankfort a/M; A. Weichselbaum, Vienna; W. H. Welch, Baltimore; Samuel Wilks, London; A. E. Wright, Netley; Von Zenker, Erlangen; E. Ziegler, Freiburg.

Keating, John M., M.D., LL.D.,

Fellow of the College of Physicians of Philadelphia; late Visiting Obstetrician to the Philadelphia Hospital, and Lecturer on Diseases of Women and Children, Philadelphia Hospital.

CYCLOPÆDIA OF THE DISEASES OF CHILDREN, MEDICAL AND SURGICAL. The articles written especially for the work by American, British and Canadian Authors. Edited by JOHN M. KEATING, M.D. In 8 vols., royal 8vo, of about 500 pages each. Illustrated with wood engravings in the text, and numerous full-page plates. Price 12s. 6d. per volume nett, carriage free. Detailed prospectus on application.

MATERNITY, INFANCY, CHILDHOOD. Hygiene of Pregnancy; Nursing and Weaning of Infants; The Care of Children in Health and Disease. Adapted especially to the use of Mothers or those intrusted with the bringing up of Infants and Children, and Training Schools for Nurses, as an aid to the teaching of the Nursing of Women and Children. Crown 8vo, cloth, pp. 221. Price 4s. 6d.

A NEW PRONOUNCING DICTIONARY OF MEDICAL TERMS. Handsome 8vo, cloth, pp. 818. Price 18s.

Keating, John M., M.D., LL.D.,
and
Coe, Henry C., M.D., M.R.C.S.,

Professor of Gynæcology, New York Polyclinic.

CLINICAL GYNÆCOLOGY, MEDICAL AND SURGICAL. By American Teachers. 2 vols., royal 8vo, cloth extra, gilt tops, pp. xviii., 994, illustrated with 34 full-page plates and 377 engravings in the text. Price 25s. nett.

Keith, Skene, F.R.C.S.,

Assisted by

Keith, George E., M.B., C.M.

TEXT-BOOK OF ABDOMINAL SURGERY. A Clinical Manual for Practitioners and Students. 8vo cloth, gilt top, pp. xvi., 508. Price **16s.** (*Pentland's Medical Series, Volume Fourth.*)

Kenwood, H. R., M.B., C.M., L.R.C.P.(Lond.),

THE ESSENTIALS OF MEDICAL ANATOMY. 12mo, cloth, pp. 52. Price **2s.**

Landis, Henry G., A.M., M.D.,

Late Professor of Obstetrics and Diseases of Women in Starling Medical College.

COMPEND OF OBSTETRICS. Third edition, thoroughly revised, enlarged, and improved, crown 8vo, cloth, pp. 118, with 17 illustrations. Price **4s. 6d.**

Lawless, E. J., M.D.,

Surgeon-Major, 4th V.B. East Surrey Regiment.

FIRST AID TO THE INJURED AND MANAGEMENT OF THE SICK. An Ambulance Handbook and Elementary Manual of Nursing for Volunteer Bearers and Others. Crown 8vo, cloth, pp. xvi., 262, with plate and numerous wood engravings. Price **3s. 6d.**

Leuckart, Rudolf,

Professor of Zoology and Comparative Anatomy in the University of Leipsic.

THE PARASITES OF MAN AND THE DISEASES WHICH PROCEED FROM THEM. A Text-Book for Students and Practitioners. Translated from the German with the co-operation of the Author by WILLIAM E. HOYLE, M.A. (Oxon.), M.R.C.S., F.R.S.E., Curator of the Museums, Owens College, Manchester. Natural History of Parasites in General.—Systematic Account of the Parasites Infesting Man.—PROTOZOA.—CESTODA. Large 8vo, cloth, pp. xxviii., 772, illustrated with 404 engravings. Price **31s. 6d.**

Liddell, John, M.D.,

Honorary Physician, Harrogate Royal Bath Hospital.

THE MINERAL WATERS OF HARROGATE. Cr. 8vo, limp cloth, pp. 64. Price **2s. nett.**

Lockwood, Charles Barrett, F.R.C.S.,

Hunterian Professor, Royal College of Surgeons of England ; Assistant Surgeon to St. Bartholomew's Hospital ; Surgeon to the Great Northern Central Hospital.

TRAUMATIC INFECTION. Hunterian Lectures delivered at the Royal College of Surgeons of England. Crown 8vo, cloth, pp. xii., 138, illustrated with 27 wood engravings in the text. Price **3s.**

ASEPTIC SURGERY. Crown 8vo, cloth, pp. 220 or thereby. *Nearly ready.*

Longley, Elias,

STUDENTS' POCKET MEDICAL LEXICON. Giving the correct Pronunciation and Definition of all Words and Terms in general use in Medicine and the Collateral Sciences. New edition, 18mo, cloth, pp. 303. Price **4s.**

McBride, P., M.D., F.R.C.P.Ed.,

Lecturer on the Diseases of the Ear and Throat, Edinburgh School of Medicine ; Aural Surgeon and Laryngologist, Royal Infirmary, Edinburgh ; Surgeon, Edinburgh Ear and Throat Dispensary.

DISEASES OF THE THROAT, NOSE, AND EAR. Second edition, revised and enlarged, 8vo, cloth, pp. xvi., 682, with coloured illustrations from original drawings. Price **25s.** (*Pentland's Medical Series, Volume Third.*)

McClellan, George, M.D.,

Lecturer on Descriptive and Regional Anatomy at the Pennsylvania School of Anatomy ; Professor of Anatomy at the Pennsylvania Academy of the Fine Arts ; Member of the Academy of Natural Sciences, College of Physicians, &c., of Philadelphia.

REGIONAL ANATOMY IN ITS RELATION TO MEDICINE AND SURGERY. In 2 handsome volumes, large 4to of over 350 pages each, illustrated with 100 full-page facsimile chromo-lithographic plates, reproduced from photographs taken by the Author of his own Dissections, expressly designed and prepared for this Work, and coloured by him after Nature. Price per volume, **42s.** nett. Carriage paid. Sold only by subscription.

Maclaren, P. H., M.D., F.R.C.S.E.,

Surgeon, Edinburgh Royal Infirmary ; formerly Surgeon in charge of the Lock Wards, Edinburgh Royal Infirmary ; Examiner in the Royal College of Surgeons, Edinburgh.

ATLAS OF VENEREAL DISEASES. A Series of Illustrations from Original Paintings with Descriptions of the Varied Lesions, their Differential Diagnosis and Treatment. In 10 fasciculi, price **6s.** each ; or complete in one handsome royal quarto volume, extra cloth, price **63s.** nett.

Martin, Sidney, M.D., F.R.S., F.R.C.P.,

Assistant Physician and Assistant Professor of Clinical Medicine at University College Hospital; Assistant Physician to the Hospital for Consumption and Diseases of the Chest, Brompton.

FUNCTIONAL AND ORGANIC DISEASES OF THE STOMACH. 8vo, cloth, pp. xx., 506. Illustrated with numerous engravings throughout the text. Price **16s.** (*Pentland's Medical Series, Volume Fifth.*)

Mills, Charles K., M.D.,

Professor of Diseases of the Mind and Nervous System in the Philadelphia Polyclinic and College for Graduates in Medicine; Lecturer on Mental Diseases in the University of Pennsylvania.

THE NURSING AND CARE OF THE NERVOUS AND THE INSANE. Crown 8vo, cloth, pp. 147. Price **4s. 6d.**

Morrow, Prince A., M.D.,

Clinical Professor of Genito-Urinary Diseases; formerly Lecturer on Dermatology in the University of the City of New York; Surgeon to Charity Hospital, New York.

SYSTEM OF GENITO-URINARY DISEASES, SYPHILOLOGY, AND DERMATOLOGY. By VARIOUS AUTHORS. Edited by PRINCE A. MORROW, M.D. In 6 divisional volumes of about 550 pages each. Royal 8vo, cloth extra, gilt tops, illustrated with coloured plates and engravings throughout the text. Price per volume, **14s.** nett. Sold only by subscription.

Muskett, Philip E., L.R.C.P. & S. Ed.,

Late Surgeon to the Sydney Hospital; formerly Senior Resident Medical Officer, Sydney Hospital.

PRESCRIBING AND TREATMENT IN THE DISEASES OF INFANTS AND CHILDREN. Third edition, revised and enlarged, 18mo, pp. xx., 336, in flexible leather binding for the pocket. Price **6s. 6d.**

Musser, John H., M.D.,

Assistant Professor of Clinical Medicine in the University of Pennsylvania; Physician to the Philadelphia and the Presbyterian Hospitals, &c.

PRACTICAL TREATISE ON MEDICAL DIAGNOSIS. For Students and Physicians. Royal 8vo, cloth, pp. viii., 882. Illustrated with 162 engravings and 2 coloured plates. Price **24s.**

Newman, David, M.D.,

Laryngologist to the Glasgow Royal Infirmary; Assistant Surgeon to the Western Infirmary; Examiner in Pathology in the University of Glasgow.

MALIGNANT DISEASE OF THE THROAT AND NOSE. 8vo, cloth, pp. xvi., 212, with 3 illustrations. Price **8s. 6d.**

Norris, W. F., A.M., M.D.,

Professor of Ophthalmology, University of Pennsylvania ; and

Oliver, C. A., A.M., M.D.,

Surgeons to the Wills Eye Hospital, Philadelphia.

TEXT-BOOK OF OPHTHALMOLOGY. Royal 8vo, cloth, pp. viii., 622. Illustrated with 5 coloured plates and 357 woodcuts. Price 25s.

Oliver, Thomas, M.D., F.R.C.P.,

Physician, Royal Infirmary, Newcastle-on-Tyne ; Professor of Physiology, University of Durham ; Honorary Physician, Newcastle-on-Tyne Dispensary and Industrial Schools.

LEAD POISONING, IN ITS ACUTE AND CHRONIC FORMS. 8vo, cloth, pp. xii., 122, with 32 illustrations, mostly in colours. Price 10s. 6d.

Osler, William, M.D., F.R.C.P.,

Professor of Medicine in the Johns Hopkins University, and Physician-in-Chief to the Johns Hopkins Hospital, Baltimore.

THE PRINCIPLES AND PRACTICE OF MEDICINE. Second Edition, thoroughly revised and largely re-written. 8vo, cloth, pp. xvi., 1143, with charts and illustrations. Price 24s.

Parvin, Theophilus, M.D., LL.D.,

Professor of Obstetrics and Diseases of Women and Children in Jefferson Medical College, Philadelphia, and one of the Obstetricians to the Philadelphia Hospital.

THE SCIENCE AND ART OF OBSTETRICS. Third Edition, thoroughly revised, large 8vo, cloth, pp. 701, with 269 wood engravings and 2 coloured plates. Price 18s.

Pekelharing, C. A.,

Professor in the Faculty of Medicine, University of Utrecht ; and

Winkler, C.,

Lecturer in the University of Utrecht.

BERI-BERI : Researches concerning its Nature and Cause and the Means of its Arrest. Translated by JAMES CANTLIE, M.A., M.B., F.R.C.S. 8vo, cloth, pp. xvi., 160, with coloured illustrations from original drawings. Price 10s. 6d. nett.

Potter, Samuel O. L., M.D., M.R.C.P.(Lond.),

Cooper Medical College, San Francisco.

COMPEND OF HUMAN ANATOMY, Including the Anatomy of the Viscera. Fifth edition, revised and enlarged, crown 8vo, cloth, pp. 289, with 117 engravings, and 6 full-page plates. Price 5s.

Practical Lessons in Nursing:

A New Series of Handbooks.   Crown 8vo, cloth.   Each **4s. 6d.**

OUTLINES FOR THE MANAGEMENT OF DIET; or, the Regulation of Food to the Requirements of Health and the Treatment of Disease.   By E. T. BRUEN, M.D., Assistant Professor of Physical Diagnosis, University of Pennsylvania; one of the Physicians to the Philadelphia and University Hospitals.

MATERNITY, INFANCY, CHILDHOOD.   Hygiene of Pregnancy; Nursing and Weaning of Infants; the Care of Children in Health and Disease.   Adapted especially to the use of Mothers or those intrusted with the bringing up of Infants and Children, and Training Schools for Nurses, as an aid to the teaching of the Nursing of Women and Children.   By JOHN M. KEATING, M.D., Lecturer on the Diseases of Women and Children, Philadelphia Hospital.

THE NURSING AND CARE OF THE NERVOUS AND THE INSANE.   By CHARLES K. MILLS, M.D., Professor of Diseases of the Mind and Nervous System in the Philadelphia Polyclinic and College for Graduates in Medicine; Lecturer on Mental Diseases in the University of Pennsylvania.

Rentoul, Robert R., M.D., M.R.C.S.,

Fellow of the Obstetrical Society, London.

THE CAUSES AND TREATMENT OF ABORTION, with an Introduction by LAWSON TAIT, F.R.C.S.   8vo, cloth, pp. xvi., 271, with coloured plates and 35 engravings.   Price **10s. 6d.**

Reports from the Laboratory of the Royal College of Physicians, Edinburgh.

Edited by J. BATTY TUKE, M.D., G. SIMS WOODHEAD, M.D., and D. NÖEL PATON, M.D.

VOLUME FIRST, 8vo, cloth, pp. 212, with 23 full-page plates and 19 engravings.   Price **7s. 6d.** nett.

VOLUME SECOND, 8vo, cloth, pp. xvi., 280, with 43 full-page plates, consisting of lithographs, chromo-lithographs, and micro-photographs.   Price **10s. 6d.** nett.

VOLUME THIRD, 8vo, cloth, pp. xii., 304, with 11 plates and folding charts.   Price **9s.** nett.

VOLUME FOURTH, 8vo, cloth, pp. xii., 254, with 25 plates and folding charts.   Price **10s. 6d.** nett.

Rotch, Thomas Morgan, M.D.,

Professor of Diseases in Children, Harvard University.

PEDIATRICS. The Hygienic and Medical Treatment of Diseases in Children. For Students and Practitioners. 2 vols. Royal 8vo, pp. xvi., 1124, illustrated with 8 full-page coloured plates and about 400 engravings in the text. Price 25s. nett.

Schech, Philip, M.D.,

Lecturer in the University of Munich.

DISEASES OF THE MOUTH, THROAT, AND NOSE. Including Rhinoscopy and Methods of Local Treatment. Translated by R. H. BLAIKIE, M.D., F.R.S.E., formerly Surgeon, Edinburgh Ear and Throat Dispensary; late Clinical Assistant, Ear and Throat Department, Royal Infirmary, Edinburgh. 8vo, cloth, pp. xii., 302, with 5 wood engravings. Price 9s.

Schmiedeberg, Dr. Oswald,

Professor of Pharmacology, and Director of the Pharmacological Institute, University of Strasburg.

ELEMENTS OF PHARMACOLOGY. Translated under the Author's supervision, by THOMAS DIXSON, M.B., Lecturer on Materia Medica in the University of Sydney, N.S.W. 8vo, cloth, pp. xii., 223, with 7 illustrations. Price 9s.

Seifert, Dr. Otto,

Privat Docent in Wurzburg; and

Muller, Dr. Friedrich,

Assistent der II. Med. Klinik in Berlin.

MANUAL OF CLINICAL DIAGNOSIS. Third edition, revised and corrected. Translated with the permission of the Authors by WILLIAM B. CANFIELD, A.M., M.D., Chief of Clinic for Throat and Chest, University of Maryland. Crown 8vo, cloth, pp. xii., 173, with 60 illustrations. Price 5s.

Sheild, A. Marmaduke, M.B., (Cantab.), F.R.C.S.,

Senior Assistant Surgeon, Aural Surgeon and Teacher of Operative Surgery, Charing Cross Hospital.

SURGICAL ANATOMY: A Manual for Students. Crown 8vo, cloth, pp. xii., 226. Price 6s. (*Pentland's Students' Manuals.*)

Skene, Alexander J. C., M.D.,

Professor of Gynecology in the Long Island College Hospital, Brooklyn, New York.

MEDICAL GYNECOLOGY: a Treatise on the Diseases of Women from the Standpoint of the Physician. 8vo, cloth, pp. vi., 530, with illustrations in the text. Price **21s.**

Smith, W. Ramsay, M.B., B.Sc.,

Formerly Demonstrator of Anatomy, Edinburgh School of Medicine, Minto House; Late Senior Assistant to the Professor of Natural History, University of Edinburgh.

EXAMINATION QUESTIONS. Set for the Professional Examinations in Edinburgh University during the past ten years, selected from the Calendars.

NATURAL HISTORY, arranged and annotated.   Price **1s.**

BOTANY, arranged and annotated.   Price **1s. 6d.**

CHEMISTRY, answered and annotated.   Price **2s.**

ANATOMY, answered and annotated.   Price **2s.**

MATERIA MEDICA AND THERAPEUTICS, answered and annotated.   Price **2s.**

PHYSIOLOGY, answered and annotated.   Price **2s.**

MIDWIFERY AND GYNÆCOLOGY, answered and annotated. Price **1s. 6d.**

PRACTICE OF PHYSIC, answered and annotated.   Price **1s. 6d.**

SURGERY, answered and annotated.   Price **1s. 6d.**

** Other Volumes to follow.

Smith, W. Ramsay, M.B., B.Sc.,

and

Norwell, J. Stewart, B.Sc.

ILLUSTRATIONS OF ZOOLOGY, INVERTEBRATES AND VERTEBRATES. New and cheaper edition, crown 4to, extra cloth, gilt top, with 70 plates exhibiting over 400 figures.   Price **7s. 6d.**

Starr, Louis, M.D.,

Late Clinical Professor of Diseases of Children in the Hospital of the University of Pennsylvania; Physician to the Children's Hospital, Philadelphia.

DISEASES OF THE DIGESTIVE ORGANS IN INFANTS AND CHILDREN. With Chapters on the Investigation of Disease and on the General Management of Children. Second edition, post 8vo, cloth, pp. 396, with illustrations.   Price **10s.**

Stephenson, Sydney, M.B., F.R.C.S.Ed.,

Surgeon to the Ophthalmic School, Hanwell, London.

EPIDEMIC OPHTHALMIA : Its Symptoms, Diagnosis, and Management. 8vo, cloth, pp. xvi., 278, illustrated with a coloured plate and numerous figures in the text. Price **9s.** nett.

System of Gynecology and Obstetrics.

By American Authors. Edited by MATTHEW D. MANN, A.M., M.D., Professor of Obstetrics and Gynecology in the Medical Department of the University of Buffalo, N.Y.; and BARTON COOKE HIRST, M.D., Associate Professor of Obstetrics in the University of Pennsylvania ; Obstetrician to the Philadelphia and Maternity Hospitals ; Gynecologist to the Orthopædic Hospital. In 8 very handsome volumes, royal 8vo, cloth, of about 400 pages each, fully illustrated with engravings and coloured plates. Price **12s. 6d.** each nett. For Sale by Subscription only.

Talamon, Ch.,

Physician to the Tenon Hospital, Paris.

APPENDICITIS AND PERITYPHLITIS. Translated from the French by RICHARD J. A. BERRY, M.B., C.M., Late President of the Royal Medical Society, Edinburgh. Crown 8vo, cloth, pp. viii., 240. Price **6s.**

Taylor, Robert W., M.D.,

Clinical Professor of Venereal Diseases at the College of Physicians and Surgeons (Columbia College), New York; Surgeon to Bellevue Hospital, and Consulting Surgeon to City (Charity) Hospital, New York.

THE PATHOLOGY AND TREATMENT OF VENEREAL DISEASES. Royal 8vo, cloth, pp. 1002, illustrated with 230 engravings in the text and 7 coloured plates. Price **22s.** nett.

Text-book on Nervous Diseases. By American Authors.

See DERCUM.

Thomson, J. Arthur, M.A.,

Lecturer on Zoology, School of Medicine, Edinburgh.

OUTLINES OF ZOOLOGY. Second edition, revised and enlarged, crown 8vo, cloth, pp. xx., 820, with 266 illustrations in the text. Price **15s.** (*Pentland's Students' Manuals.*)

Vierordt, Oswald, M.D.,

Professor of Medicine at the University of Heidelberg.

CLINICAL TEXT-BOOK OF MEDICAL DIAGNOSIS, for Physicians and Students. Based on the most Recent Methods of Examination. Translated, with additions from the second enlarged German edition, with the Author's permission. By FRANCIS H. STUART, M.D., Member of the Medical Society of the County of Kings, New York. Large 8vo, cloth, pp. xvi., 700, with 178 fine engravings, many in colour. Price **18s.**

Walley, Thomas, M.R.C.V.S.,

Late Principal of the Edinburgh Royal (Dick's) Veterinary College; Professor of Veterinary Medicine and Surgery.

A PRACTICAL GUIDE TO MEAT INSPECTION. Third edition, thoroughly revised and edited by J. M'FADYEAN, Principal and Professor of Comparative Anatomy, Royal Veterinary College, London. Post 8vo, with coloured illustrations. In Press.

Warren, Geo. W., D.D.S.,

Clinical Chief, Pennsylvania College of Dental Surgery.

COMPEND OF DENTAL PATHOLOGY AND DENTAL MEDICINE. Crown 8vo, cloth, pp. 109, illustrations. Price **4s. 6d.**

Webster, J. Clarence, B.A., M.D., F.R.C.P.Ed.,

Assistant to the Professor of Midwifery and Diseases of Women and Children in the University of Edinburgh.

ECTOPIC PREGNANCY, its Etiology, Classification, Embryology, Diagnosis, and Treatment. 8vo, cloth, pp. xvi., 240, with 22 pages of plates and figures throughout the Text. Price **12s. 6d.** nett.

RESEARCHES IN FEMALE PELVIC ANATOMY. Demy 4to, cloth, illustrated with 26 full-page coloured plates, from original drawings. Price **30s.** nett.

TUBO-PERITONEAL ECTOPIC GESTATION. Demy 4to, cloth, illustrated with 11 full-page plates, exhibiting numerous figures. Price **16s.** nett.

Wharton, Henry R., M.D.,

Demonstrator of Surgery and Lecturer on the Surgical Diseases of Children, University of Pennsylvania.

MINOR SURGERY AND BANDAGING, including the Treatment of Fractures and Dislocations, &c. &c. Post 8vo, cloth, pp. 496, with 403 engravings. Price **12s. 6d.**

Winckel, Dr. F.,

Professor of Gynæcology and Director of the Royal Hospital for Women ; Member of the Supreme Medical Council and of the Faculty of Medicine in the University of Munich.

TEXT-BOOK OF OBSTETRICS, including the Pathology and Therapeutics of the Puerperal State. Designed for Practitioners and Students of Medicine. Translated from the German under the supervision of J. CLIFTON EDGAR, A.M., M.D., Adjunct Professor of Obstetrics in the Medical Department of the University of the City of New York. Royal 8vo, cloth, pp. 927. Illustrated with 190 engravings, mostly original. Price 28s.

Woodhead, G. Sims, M.D., F.R.C.P.Ed.,

Director of the Laboratories of the Royal Colleges of Physicians (London) and Surgeons (England).

PRACTICAL PATHOLOGY : A Manual for Students and Practitioners. Third enlarged and thoroughly revised edition, 8vo, cloth, pp. xxiv., 652, with 195 coloured illustrations, mostly from original drawings. Price 25s

Woodhead, G. Sims, M.D., F.R.C.P.Ed.,

and

Hare, Arthur W., M.B., C.M.

PATHOLOGICAL MYCOLOGY : An Enquiry into the Etiology of Infective Diseases. Section I.—Methods. 8vo, cloth, pp. xii., 174, with 60 illustrations, mostly original (34 in colours). Price 8s. 6d.
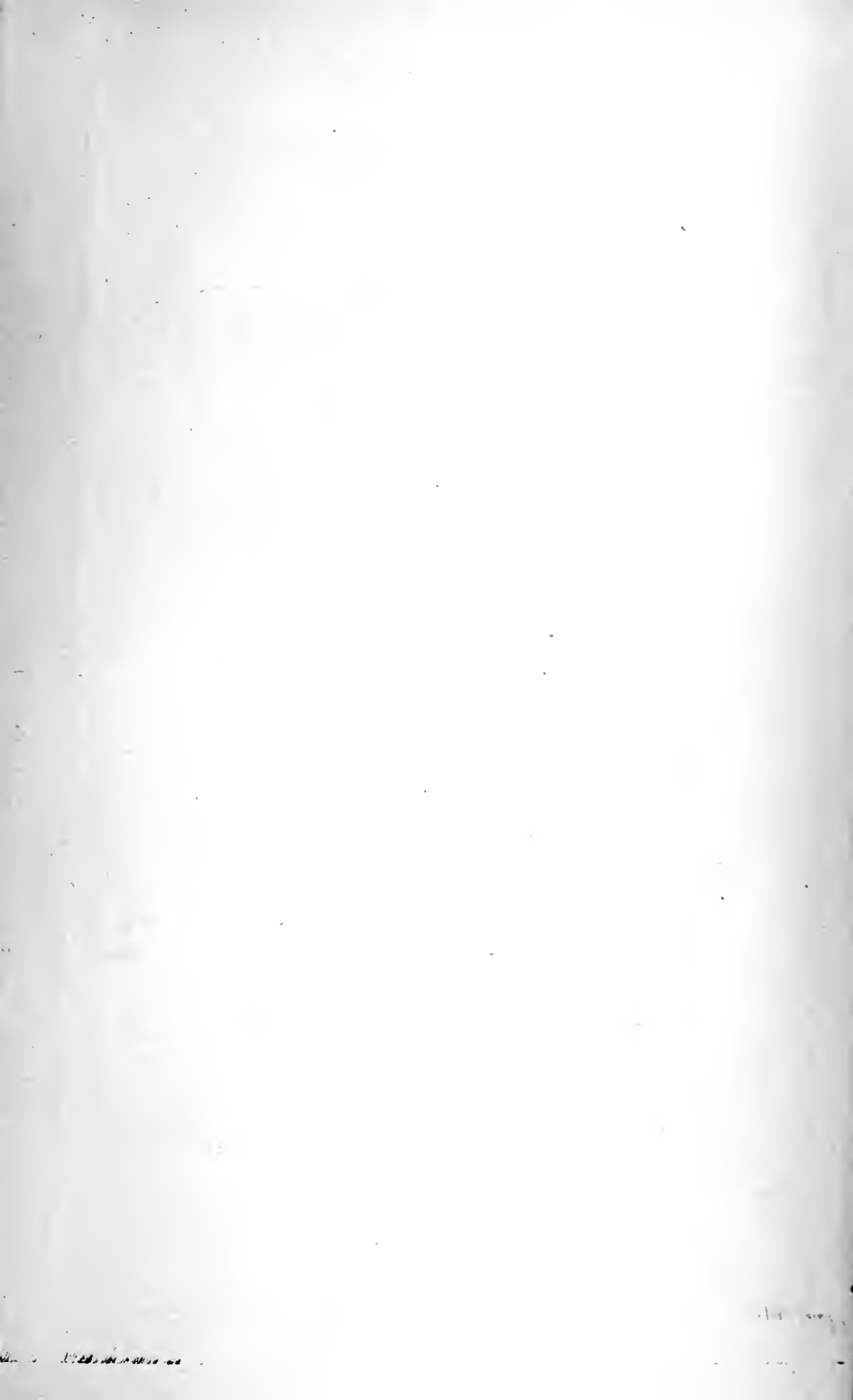
CLASSIFIED INDEX.

——•◦——

Clinical Medicine (Studies in),	. .	BRAMWELL.
,, ,,	. . .	GIBSON & RUSSELL.
,, ,,	. . .	MUSSER.
,, ,,	. . .	VIERORDT.
Cyclopædia of the Diseases of Children,	.	KEATING.
Dental Pathology,	. . .	WARREN.
Dentistry (System of),	. . .	LITCH.
Dermatology (Atlas),	. . .	CROCKER.
,,	. . . .	JAMIESON.
,,	. . . .	MORROW.
Diagnosis (Ophthalmoscopic),	. .	BERRY.
,, (Physical),	. . .	GIBSON & RUSSELL.
,, (Medical),	. . .	MUSSER.
,, (Clinical),	. . .	SEIFERT & MULLER.
,, (Medical),	. . .	VIERORDT.
Dictionary of Terms (5 languages),	.	BILLINGS.
,, ,,	. . .	KEATING.
,, ,, (Pocket),	. .	LONGLEY.
Diet,	. . . . .	BRUEN.
Digestive Organs in Children,	. .	STARR.
Ear (Diseases),	. . . .	BURNETT.
,, ,,	. . . .	M'BRIDE.
Ectopic Gestation,	. . .	WEBSTER.
Edinburgh Hospital Reports.		
Epidemic Ophthalmia,	. . .	STEPHENSON.
Epilepsy,	. . . . .	ALEXANDER.
Examination Questions,	. . .	SMITH.
Eye (Diseases),	. . . .	BERRY.
,, (Atlas),	. . . .	FROST.
,, (Diseases),	. . . .	NORRIS & OLIVER.
,, (Ophthalmia),	. . .	STEPHENSON.
First Aid to Injured,	. . .	LAWLESS.
Genito-Urinary Diseases,	. . .	MORROW.
Geographical Pathology,	. . .	DAVIDSON.
Gestation (Ectopic),	. . .	WEBSTER.
Gynæcology (Text Book),	. . .	KEATING & COE.
,, (Medical),	. . .	SKENE.
,, (Exam. Quests.),	. .	SMITH.
,, and Obstetrics (System of),	.	MANN & HIRST.
Harrogate Waters,	. . .	LIDDELL.
Heart (Diseases),	. . . .	BRAMWELL.

Hospital Reports (Edinburgh).
Human Monstrosities,　　.　　.　　.　　HIRST & PIERSOL.
Hydatid Disease,　.　　.　　.　　.　　GRAHAM.
Hygiene and Diseases of Warm Climates, .　DAVIDSON.

Infective Diseases,　　.　　.　　.　　LOCKWOOD.
Intracranial Tumours,　　.　　.　　.　　BRAMWELL.

Joints (Tuberculous Disease),　　.　　.　　CHEYNE.
Journal of Pathology.

Laboratory Reports (R. C. P. Edinburgh).
Lead Poisoning,　.　　.　　.　　.　　OLIVER.

Malignant Disease of Throat and Nose,　.　NEWMAN.
Materia Medica (Exam. Quests.), .　　.　SMITH.
Maternity, Infancy and Childhood,　　.　KEATING.
Meat Inspection,　.　　.　　.　　.　WALLEY.
Medical Anatomy,　　.　　.　　.　KENWOOD.
　　„　　Diagnosis,　　.　　.　　.　MUSSER.
　　„　　　„　　.　　.　　.　VIERORDT.
　　„　　Dictionary (5 languages),　　.　BILLINGS.
　　:.　　　„　　.　　.　　.　KEATING.
　　„　　　„　　(Pocket),　　.　　.　LONGLEY.
　　„　　Gynæcology,　　.　　.　　.　SKENE.
Medicine (Compend of),　.　　.　　.　HUGHES.
　　„　　(Text-Book of), .　　.　　.　OSLER.
　　„　　(Exam. Quests.),　　.　　.　SMITH.
Midwifery (Compend of), .　　.　　.　LANDIS.
　　„　　(Text-Book of),　　.　　.　PARVIN.
　　„　　(Exam. Quests.),　　.　　.　SMITH.
　　„　　(System of),　.　　.　　.　MANN & HIRST.
　　„　　(Text Book of),　　.　　.　WINCKEL.
Mineral Waters (Harrogate),　　.　　.　LIDDELL.
Monstrosities (Human),　.　　.　　.　HIRST & PIERSOL.
Morbid Anatomy, .　　.　　.　　.　HALL.
Mouth, Throat and Nose (Diseases),　　.　SCHECH.

Natural History (Exam. Quests.),　　.　SMITH.
　　„　　　„　　(Illustrations),　.　.　SMITH & NORWELL
　　„　　　„　　(Text Book),　.　.　THOMSON.
Nervous Diseases (Epilepsy),　　.　　.　ALEXANDER.
　　„　　　„　　(Text-Book),　.　.　DERCUM.
　　„　　　„　　(Nursing),　.　.　MILLS.
Nose (Diseases),　.　　.　　.　　.　McBRIDE.
　　„　(Diseases),　.　　.　　.　　.　SCHECH.

Nose and Throat (Malignant Disease of) . NEWMAN.
Nursing (Obstetric), . . . HAULTAIN & FERGUSON.
  ,,   (Children), . . . KEATING.
  ,,   (First Aid), . . . LAWLESS.
  ,,   (Insane), ... MILLS.

Obstetric Nursing, ... HAULTAIN & FERGUSON.
Obstetrics (Compend of), . . . LANDIS.
  ,,   (Science and Art of), . . PARVIN.
  ,,   (System of), . . . MANN & HIRST.
  ,,   (Text Book of), . . . WINCKEL.
Ophthalmia (Epidemic), . . . STEPHENSON.
Ophthalmology (Text-Book of), . . NORRIS & OLIVER.
Ophthalmoscopic Diagnosis, . . BERRY.
Ophthalmoscopy (Atlas of), . . FROST.

Parasites of Man, ... LEUCKART.
Pathological Mycology, . . . WOODHEAD & HARE
Pathology (Geographical), . . . DAVIDSON.
  ,,   (Practical), . . . GIBBES.
  ,,   (Compend of), . . . HALL.
  ,,   (Dental), . . . WARREN.
  ,,   (Practical), . . . WOODHEAD.
Pathology and Bacteriology (Journal of).
Pediatrics, ... CARMICHAEL.
  ,, ... KEATING.
  ,, ... ROTCH.
Pharmacology, ... SCHMIEDEBERG.
Phthisis (Pulmonary), . . . JAMES.
Physical Diagnosis, . . . GIBSON & RUSSELL.
Physiology (Exam. Quests.), . . SMITH.
Poisoning (Lead), ... OLIVER.
Practice of Medicine (Compend of), . HUGHES.
  ,,   ,,   (Text Book of), . OSLER.
  ,,   ,,   (Exam. Quests.), . SMITH.
Pregnancy (Ectopic), . . . WEBSTER.
Prescribing and Treatment of Children's Diseases, MUSKETT.

Regional Anatomy, . . M'CLELLAN.
Reports, Edinburgh Hospital.
  ,,   **R. C. P. Laboratory, Edinburgh.**

Septic Diseases, ... CHEYNE.
Sexual Organs (Diseases), . . . FULLER.

Skin Diseases (Atlas of), . . .	CROCKER.
,, ,, ...	JAMIESON.
,, ,, ...	MORROW.
Stomach (Diseases), . . .	EWALD.
,, (Diseases), . . .	MARTIN.
Surgery (Compend of), . . .	HORWITZ.
,, (Abdominal), . . .	KEITH.
,, (Aseptic), . . .	LOCKWOOD.
,, (Exam. Quests.), . . .	SMITH.
,, (Minor), ...	WHARTON.
Surgical Anatomy, . . .	SHEILD.
Syphilology, ...	MORROW.
System of Dentistry, . . .	LITCH.
,, **Genito-Urinary Diseases,** .	MORROW.
,, **Therapeutics,** . .	HARE.
Therapeutics (Synopsis), . . .	AITCHISON.
,, (System), . . .	HARE.
,, (Physical and Natural), .	HAYEM & HARE
,, (Exam. Quests.), . .	SMITH.
Throat (Diseases), . . .	SCHECH.
,, **and Nose** (Malignant Disease of), .	NEWMAN.
,, **Nose and Ear** (Diseases), . .	McBRIDE.
Traumatic Infection, . . .	LOCKWOOD.
Tropical Diseases, ...	DAVIDSON.
,, ,, ...	FELKIN.
Tumours (Intracranial), . . .	BRAMWELL.
Ulcers (Treatment), . . .	CHEYNE.
Urine, ...	HOLLAND.
Venereal Diseases, ...	MACLAREN.
,, ,, . . .	TAYLOR
Warm Climates (Diseases), . .	DAVIDSON.
Women (Diseases of), . . .	KEATING & COE.
,, (Diseases), . . .	SKENE.
Wounds (Treatment), . . .	CHEYNE.
Zoology (Exam. Quests.), . . .	SMITH.
,, (Illustrations of), . . .	SMITH & NORWELL.
,, (Outlines of), . . .	THOMSON.